

MONSOON ASIA

VOLUME TWO

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PREFACE

MONSOON ASIA Volumes One and Two provide a basic text on the regional study of the Monsoon Lands of Asia. The study is based on political units and covers the physical, environmental and social aspects of the geography of each country.

Volume One deals with the countries of India, Pakistan, China, Japan, Korea, Taiwan and Hong Kong and excludes the Monsoon Lands of South-East Asia. Volume Two deals specifically with the mainland and insular parts of South-East Asia.

This series is specially intended for students preparing for the General Certificate of Education at Ordinary Level and covers part of the Regional and Human Geography paper at Advanced Level. It will also meet the requirements of students interested in the study of the geography of contemporary Monsoon Asia.

The text is up-to-date and contains the latest available data. Detailed maps and diagrams in full colour are inserted for specific correlation to the text so as to give the student a comprehensive study of the subject. Great care has been taken in the selection of pictures, which are meaningful and illustrative of the text. They are designed to bring out salient facts to help students gain a better understanding of the contents.

The object of the relevant and general questions at the end of each chapter is to assist the pupil in recapitulation and to stimulate research. In order to derive maximum benefit from the exercises, the student should attempt all the questions. Class discussion of questions should also be encouraged to widen the perspective of the subject matter.

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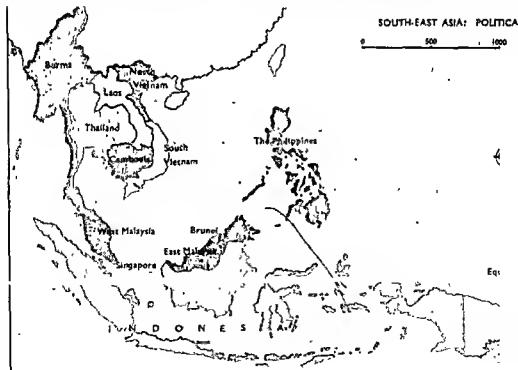
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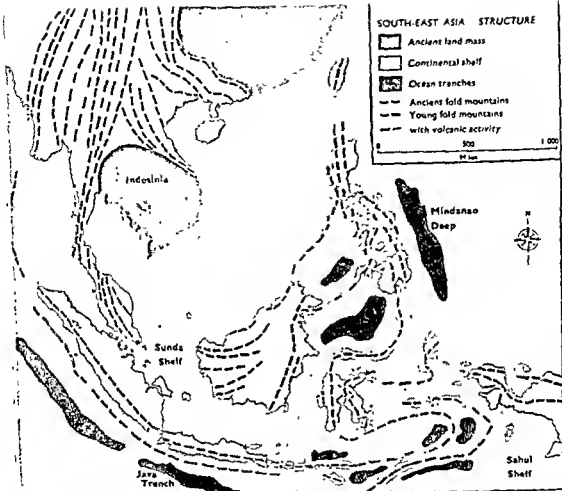
South-East Asia: Introduction

South-East Asia (a term which has become widely used since the Second World War) consists of an insular region and a mainland region which together form a broad wedge between the densely populated Indian sub-continent to the west and China to the north. Stretching from $28^{\circ} 30'N$ to $11^{\circ}S$ and from $92^{\circ} 20'E$ to $140^{\circ}E$, (including West Irian), South-East Asia includes the countries of Burma, Thailand, Laos, North Vietnam, South Vietnam, Cambodia, Malaysia, Singapore, Indonesia and the Philippines. South-East Asia has a total area of some 9 million square miles.

But of this total, about four-fifths is covered by sea. Of the total land surface of approximately 1,732,000 square miles, mainland South-East Asia accounts for about 795,000 square miles, the remainder being divided between the archipelagos of Indonesia and the Philippines.

West Irian (160,617 square miles) is geographically not a part of South-East Asia, but is more closely related in terms of flora and fauna as well as structure to the Australian continent. Nevertheless, a discussion of West Irian is included as it is now a part of the Republic of Indonesia.





Structure and Relief

The present-day structure of South-East Asia is formed by successive periods of mountain-building. The oldest portion of the land is believed to be Indosinia. Around this ancient land mass, a series of foldings took place. The process of mountain-building repeated itself: the land was uplifted, worn down by erosion, and another folding occurred on the margins. Thus, the most recent folding forms the outer arc of mountains in South-East Asia. The resultant structure of both mainland and insular South-East Asia is, therefore, highly complex.

South-East Asia may be divided into three structural units:

1. The Sunda Shelf.
2. The Sahul Shelf.
3. The young mountains and volcanic arcs which lie between the other two units.

THE SUNDA SHELF

This is an ancient block which underlies the island of Borneo, eastern Sumatra, northern Java and peninsular West Malaysia. This area was folded in early geologic times. But the tectonic stability of the Shelf

suggested by the absence of volcanoes and earthquakes and the characteristically denuded relief towards the centre, indicates that the mountain building process has long passed its climax in this region.

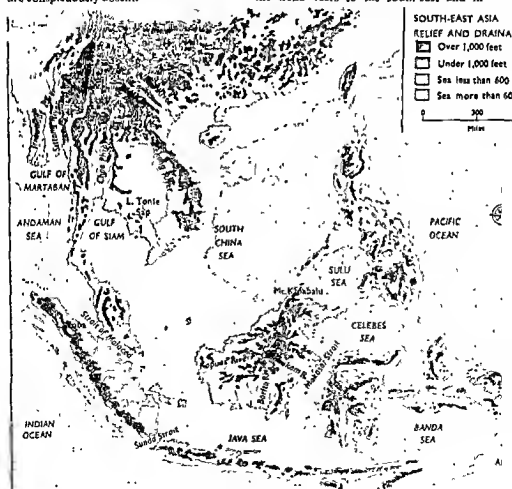
THE SAHUL SHELF

The Sahul Shelf is similar to the Sunda Shelf. It is an extension of the Australian continent and links New Guinea and the adjacent islands to that continental land mass. Like its counterpart, the Sahul Shelf is an area of stability and therefore volcanoes are conspicuously absent.

THE YOUNG MOUNTAINS AND VOLCANIC ARCS

Lying between these two stable crusts is an unstable area which has been considerably folded in more recent geologic times. This is a region of active vulcanicity and where the structural trends are very complicated.

On mainland South-East Asia, the north-south structural trend of the mountains is very pronounced in the north. A ridge-and-valley type of relief has developed and this has resulted in the Irrawaddy, Salween, Chao Phraya, Mekong and Red rivers having somewhat parallel courses. Farther south, the trend veers to the south-east and in



SOUTH-EAST ASIA

Borneo, in a north-east — south-west alignment.

In insular South-East Asia, there are an inner fold line and an outer fold line of parallel mountain ridges. The outer chain appears only as a string of islands which runs from Burma in a wide arc south and west of Sumatra to Maluku, Sulawesi and the Philippines. The inner arc is a continuation of the Himalayan fold mountain system. The chain appears first in Burma (the Arakan Yoma) and crops up next as the backbone of Sumatra (Bukit Barisan). It continues through Java, Bali, the islets in the Flores and Banda seas to Sulawesi. Extinct and active volcanoes, which number more than 200, mark this inner fold.

While the depths of the Sunda and Sahul shelves are fairly shallow, notable oceanic deeps are found to the south of Sumatra and Java, and to the west of the Philippines. Indeed, the Java trench is over 4,300 fathoms deep. The Mindanao trench is more than seven miles deep. These deep trenches in the ocean floor probably resulted from violent land movements.

The difference in stability between mainland and insular South-East Asia is reflected in the difference in relief. The mainland is characterised by more subdued relief although in the north there are lofty ranges and plateaus. Throughout the mainland region, the relief pattern is one of alternating ridges and valleys, resulting from the north-south structural trend. This upland character of the region presents serious barriers to movement and settlement. Thus, population is concentrated in the alluvial valleys and plains, for example, in the Irrawaddy and Chao Phraya basins.

Insular South-East Asia is dominated by rugged mountainous backbones and majestic volcanic cones which sometimes rise to

heights above 10,000 ft. The islands which lie further east, in an area of instability and deep seas, are characteristically more rugged and mountainous with narrow coastal plains. In some cases, the coastal plain is virtually absent. These islands are the peaks of submerged mountain ranges. The highlands are negative areas and population is largely concentrated in the coastal plains and valleys.

Seas and Rivers

The inundation of the Sunda and Sahul shelves has given rise to the present insular character of South-East Asia. Four-fifths of its total area is covered by seas, which are for the most part shallow, and the region has an exceptionally long coastline. These seas are important in inter-island communications. The role of these seas increased in importance with the colonisation and development of trade by the Europeans. This is especially true of the Strait of Malacca which has experienced increased shipping traffic since the days of the European spice trade. The opening of the Suez Canal further boosted the usage of the seas of archipelago South-East Asia.

The seas are also a source of fish which forms an important item of diet amongst the population. Often, fish serves as the only source of animal protein. Intensive fishing of the coastal waters has been carried out by the predominantly coastal population of South-East Asia from time immemorial. But the region's deep waters have been neglected. In recent times, deep-sea trawling has been carried out. Singapore, too, is starting to engage in trawler fishing to increase the Republic's output of fish.

The warm waters of these tropical seas and the presence of nutrients have also given rise to coral formations. Corals die if they

are covered with mud or if exposed to the air. But where favourable conditions exist, corals thrive. The formation of corals poses dangers to shipping and trade in the region.

The generally heavy rainfall experienced in South-East Asia has given rise to a network of perennial rivers, the valleys of which have been the foci of settlement and development. In an environment of swamps, dense jungles and forested mountains, the rivers have become natural highways of communication and transport. Settlements therefore have tended to be coastal and riverine in character.

Most of the rivers are navigable for part of their courses but their usefulness is hindered by fluctuations in the volume of discharge which is primarily dependent on the seasonal distribution of rainfall. Rapids and shifting sandbars also tend to reduce their importance. Nevertheless, in a region where the development of land transport is backward, the rivers are still important for the transportation of goods and people.

The rivers of mainland South-East Asia are considerably longer than those of the insular region. For example, the Mekong, the largest river in the mainland, has a total length of some 2,600 miles. Extensive flood plain development and delta building are characteristic of the rivers which drain the lands of mainland South-East Asia. The great erosive power of the rivers in their upper courses and the lack of tidal scour have combined to encourage rapid sedimentation. The Irrawaddy is extending its delta at the rate of 200 feet per annum. In the sheltered waters of the Sunda Shelf, too, deltas are built up. For example, the Solo river in Java is extending its delta seawards at a rate of 300 feet annually.

Whilst the rivers in most parts are still important as highways, their importance may

decline with the greater development of land transport. But they are not lacking in other functions. The rivers provide potable water and are a source of fish. Water from the rivers is also used to irrigate the fields. With the drive for greater agricultural output amongst the South-East Asian countries, there would be an increasing number of irrigation projects. Water from rivers has also been harnessed for the production of electricity.

Climate

There are several factors to be considered in a study of the climate of South-East Asia. They are:

1. The geographical position
2. The monsoonal wind system.
3. The topography of mainland South-East Asia and insular South-East Asia.
4. The effect of altitude on both temperature and rainfall

The geographical position

South-East Asia, extending from 28° 30' N to 11° S, lies mostly in the tropics. Indeed, the equator passes through insular South-East Asia. Arising from this, the lands experience a climate with uniformly high temperatures throughout the year. The average relative humidity, too, is high. High annual rainfall totals characterise the rainfall of the region.

The monsoonal wind system

The seasonal swing of the monsoons brings an element of seasonality to the climate of South-East Asia. These winds are related to the pressure cells over the Central Asian land mass and the Australian continent. The reversal of the monsoon winds and the deflection of the winds on crossing the equator both have their effects on the

SOUTH-EAST ASIA

climate of South-East Asia

The topography

The climate of mainland South-East Asia is affected to some extent by the ridge and valley topography of the land. Longitudinal highland ridges have the effect of shielding off rain-bearing winds and causing rain-shadow effects on the leeward side. This is exemplified in the *Dry Zone of Burma* and the central lowlands of Thailand. The rain-bearing winds of the South-West Monsoon deposit their moisture on the windward sides of the Arakan Yoma in Burma and the Western Highlands in Thailand. On crossing the mountain ridges, the winds become dry and bring hardly any rain to the inland areas.

Insular South-East Asia, on the other hand, is marked by the influence of the seas which modify the climate. Winds readily pick up moisture on blowing across the warm waters of the inland seas of insular South-East Asia. Temperatures are modified by the insular influences and local land and sea breezes. Annual temperature ranges are kept low.

Altitude

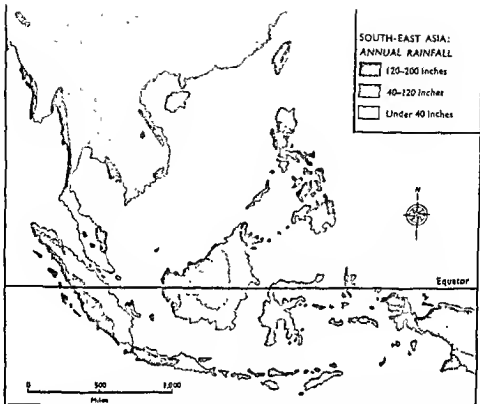
Altitude is also an important factor in the modification of climate in South-East Asia. It is common to find hill-stations throughout countries of South-East Asia which experience relatively cool weather conditions. The Cameron Highlands (4,750 ft.) in West Malaysia have average annual temperatures of about 65°F; Bandung (2,395 ft.) in Java has temperature averages of around 70°F. Lashio on the Shan Highlands in Burma experiences average temperatures of approximately 70°F.

Noting the factors discussed, the characteristics of the climate of South-East Asia are summarised as follows:

1. Uniformly high temperatures throughout the year.
2. High humidity.
3. Heavy annual rainfall totals.
4. An element of seasonality in the climate due to the seasonal swing of the monsoons.
5. A daily range of temperature which is more marked than any seasonal range.

CLIMATIC TABLE OF SELECTED STATIONS

Place	Lat.	Long.	Alt.	MONTH												Temperature	
				J	F	M	A	M	J	J	A	S	O	N	D		
HAIGON	11°N		S.L.	79	81	84	85	84	82	81	82	81	81	80	79	8	Range
	107°E			INS.	07	01	06	20	26	13.2	12.3	11.3	13.3	10.8	4.7	2.7	80
AKYAB	20°N		20 FT.	74	75	79	83	84	82	81	81	81	82	78	75	10	Range
	92°E			INS.	01	01	05	2.2	13.9	49.2	54.8	42.3	23.6	11.5	5.0	0.7	204
KUPANG	10°S		40 FT.	78	79	80	80	80	77	77	78	79	80	79	78	3	Range
	124°E			INS.	22.7	14.3	4.1	1.8	0.1	1.9	0.1	0.1	0.1	7.8	4.2	10.6	67



6. Temperature and rainfall are influenced by altitude.
7. The general lack of climatic variations over such a wide area.

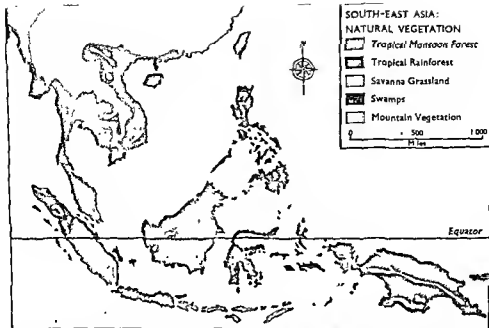
TEMPERATURE

The average sea-level temperatures for most parts of South-East Asia are remarkably uniform, varying not more than 10° from the average of 80°F . Differences in the temperatures recorded, though affected by latitude, are more a function of insularity. Thus, Singapore (1°N) has a mean annual temperature of 80°F with an annual range rarely exceeding 4°F . Further north and south, greater seasonal differences in temperature are experienced. For example, Saigon (11°N) has a mean annual temperature of 82°F and an annual range of 6°F , and Akyab (20°N) records an average

of 79°F with an annual range of 10°F . Thus both experience tropical rather than equatorial climatic conditions. In northern Thailand and Vietnam, tropical monsoon conditions bring about a greater range between the wet and dry seasons.

The seas which surround the region play an important role in the modification of temperatures. Thus Kupang in Indonesia (10°S), experiences an annual range of only 3°F .

There are two important exceptions to high temperature uniformity. Highland settlements above 7,000 feet have uniform but lower temperatures due to the effect of altitude. The Cameron Highlands (4,750 feet) in West Malaysia have an average annual temperature of 65°F and an annual range of 3°F . In general, such upland stations around 4,000–5,000 feet have tem-



cover for permanent cultivation and settlement. Even then, this represents only a relatively small proportion of the region's total land area. These areas are to be found mainly in Java, west-central Luzon in the Philippines, the west coast of West Malaysia and the river valleys and coastal plains of mainland South-East Asia.

A close relationship exists between the climate of a region and its natural vegetation. From our study of the climatic regions, it is apparent then that two main types of forests exist in South-East Asia. They are:

1. The tropical or equatorial rainforest.
2. The tropical monsoon forest.

THE EQUATORIAL RAINFOREST

This vegetation type is found in areas which lie astride the equator where rainfall is evenly distributed throughout the year and where no marked dry season exists. The equatorial rainforest may also occur beyond the latitudinal limits of the equatorial climate where local topography modifies the tropical monsoon conditions.

The equatorial rainforest is extremely dense and frequently three separate layers or storeys may be recognised. The tallest trees (100–180 feet high), forming the first storey, protrude from the second storey of trees which form the roof of the forest. Below these two layers is the undergrowth of shrubs and small plants.

A further characteristic of this forest type is the great number of tree species, which hinder the economic exploitation of the forests. Both hardwood and softwood species are obtained from the forest. In Malaysia, the main commercial species are *chengal*, *merbau*, *nyatoh* and *meranti*, all hardwood varieties. Other products, such as bamboo, resin and jelutong, are also obtained.

THE TROPICAL MONSOON FOREST

The distinct dry season which prevails in tropical monsoon regions gives rise to a more open forest with fewer species of trees. This is a deciduous forest where trees lose their leaves in the dry season, thereby increasing the risk of forest fires.

The monsoon forest is distributed in two broad zones. The more extensive zone occupies northern Burma, Thailand and Indo-China and the less extensive zone covers eastern Java and the islands stretching from Bali to Timor.

In this forest type, single species dominate. For example, uniform stands of teak, which provide valuable commercial timber, may be found in Burma and Thailand. Bamboo forests occur in single stands in the northern part of South-East Asia. Small areas of parkland occur in upland Laos and central Burma where rainfall totals are less than 40 inches annually. Tall coarse grasses typical of savanna areas, interspersed with low clumps of deciduous trees, are characteristic.

Other vegetation types do occur but the areas they occupy are significantly smaller than the two types of forests that we have so far discussed.

SECONDARY FORESTS

The removal of the primary forest cover results in a secondary growth of small trees, lalang and shrubs. The undergrowth is thick. In West Malaysia these forests are known as *belukar*.

The creation of such forests is due partly to fires and partly to the activities of man, especially the shifting cultivators who abandon their cultivated clearings after two or three harvests when soil fertility has been exhausted.

MANGROVE SWAMPS

Mangrove swamps are widely distributed in South-East Asia, occurring where rapid sedimentation of the coasts is taking place. Thus they occur along the sheltered shores of the Sunda and Sahul shelves as well as near the mouths of rivers. Large stretches

of these swamps occupy eastern Sumatra and southern and western Borneo.

The mangrove thrives in mud and brackish conditions. Consolidation of the mud by the mangrove roots helps to extend the land further seawards.

The mangrove swamps are important as sources of firewood, charcoal and tannin, besides providing timber and building material.

CASUARINA TREES

Along the more exposed shores where sedimentation does not take place, a different vegetation type exists. On these sandy beaches, the graceful casuarinas grow. These trees provide timber for boat building.

Far more common are the coconut palms which grow on sandy and porous coastal soils.

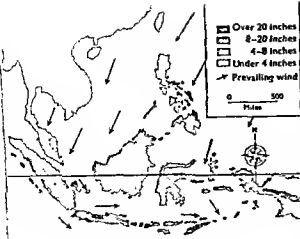
MOUNTAIN VEGETATION

Natural vegetation is modified by altitude. Thus the lowland rainforests gradually give way to sub-montane forests of oaks and maples. Higher up, mountain forests of pines merge with mountain vegetation of grasses and shrubs which predominate above the tree line (10,000-14,000 feet).

Soils

The interaction and combination of many factors influence the type of soil which develops in any area. The parent rock, climate, organisms and relief are the major factors. In South-East Asia, where the climate is uniform, the main determining factor of soil development is the parent material.

Soil may be broadly defined as the surficial layer of loose earth which results from the weathering, both physical and chemical, of the underlying parent material. Contrary to popular belief, the soils of South-East Asia



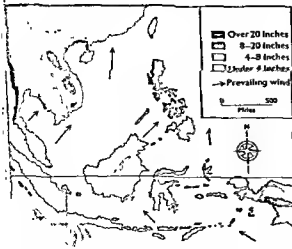
SOUTH-EAST ASIA: JANUARY RAINFALL

peratures some 20° lower than lowland regions in similar latitudes. Night temperatures tend to be low (in the low 50's) but humidity remains high.

RAINFALL

South-East Asia is generally a well-watered land which receives its rainfall from trade winds and the monsoons. Most regions receive more than 60 inches annually but there are inland areas in the rainshadow of mountain barriers, which have lower totals. Areas of central Burma, Thailand and the Philippines fall into the category of 30-60 inches per annum. Lower rainfalls are also experienced in eastern Java and the islands stretching between Java and

SOUTH-EAST ASIA: JULY RAINFALL



Timor. The east coast of West Malaysia, the west coast of Sumatra and coastal Burma, however, have annual rainfall totals of over 120 inches.

The climate of South-East Asia, and especially the seasonal distribution of rainfall, is controlled by the swing of the monsoons. During the summer months, Central Asia heats up and the rising hot air builds up an intense low pressure area. At the same time, a high pressure cell develops over the interior of the Australian continent. The winds move out and blow outwards from the high pressure area towards the centre of low pressure in Central Asia. Originating as south-easterlies, these winds are deflected to the right on crossing the equator, thus becoming the South-West Monsoon north of the equator. During these months (June to September), Sumatra, West Malaysia, Java and Borneo receive light rainfall, while the west coast of Burma, the south-eastern coast of Thailand and the uplands of Vietnam receive heavy rains brought by the South-West Monsoon.

In winter, the pattern is reversed. The Central Asian land mass cools while the Australian land mass heats up. An intense high pressure area forms over interior Asia and monsoon winds pour out southwards to fill in the low pressure that has now developed over northern Australia and the southern Indian Ocean. From November to March, South-East Asia experiences the North-East Monsoon. In Thailand, Burma, Cambodia, Laos and Vietnam, the monsoon is dry. *Initially dry and bitterly cold*, these winds are modified in their movement southwards so that they become moisture-laden, bringing heavy rainfalls to the east coast of West Malaysia. South of the equator, the north-easterlies become the north-westerlies, and associated with these

are the heavy rainfalls deposited along south-western Borneo, southern Sumatra and Java. Upland regions lying in the path of these monsoon winds receive very heavy relief or orographic rain.

In addition to precipitation associated with the monsoons, the equatorial latitudes experience rainfall resulting from convectional heating. This form of precipitation comes as heavy localised showers in the afternoons.

'Sumatras', which originate in Sumatra, are violent convectional storms. These move eastwards across the Strait of Malacca and bring heavy rain to the west coast of West Malaysia from Port Swettenham to Singapore. These storms usually occur in the night and the early hours of the morning and last only a few hours.

Heavy precipitation is also associated with typhoons or tropical cyclones. The peak period when typhoons occur is from the months of July to November. These typhoons originate east of the Philippines and travel westwards towards these islands and Indo-China. Torrential rain is associated with the typhoons. Often these tropical storms are so violent that they bring widespread destruction to built-up and cultivated areas.

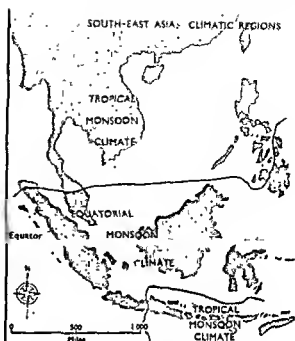
Climatic Regions

There are only two significant climatic types in South-East Asia. They are:

1. The equatorial monsoon climate.
2. The tropical monsoon climate.

THE EQUATORIAL MONSOON CLIMATE

The limits of this climatic region approximate the latitudes 5°N and 5°S . Within these latitudes, the true equatorial type of climate is experienced, with rain all the year round, no definite dry season



and a marked rainfall maximum derived from the North-East Monsoon.

THE TROPICAL MONSOON CLIMATE

Beyond these latitudinal limits, the tropical monsoon climate prevails. This climate is best developed in Burma, Thailand, Cambodia, Laos, North Vietnam and South Vietnam and to a lesser degree in the Philippines, Java and the islands which stretch from Bali to Timor.

This climate is characterised by greater seasonal variation in temperature and rainfall though the averages and totals do not differ significantly from the equatorial climate. There is a marked dry season (November to March in the north and June to September in the south), which makes these lands climatically ideal for the cultivation of padi.

Vegetation

Originally, the whole of South-East Asia was forested. Only in recent times has there been any extensive clearing of this forest



In plantations such as this one in West Malaysia, the soil is carefully protected from excessive erosion. Contour bunding with a cover crop planted on the bunds is a common practice. If you look carefully, you will be able to see young rubber trees growing

are infertile. The luxuriant natural vegetation of rainforest does not indicate the inherent fertility of tropical soils for when the vegetation is cleared, the infertility of the soils is evident.

Three main types of soils may be recognised in South-East Asia. They are:

1. Laterites and associated soil types.
2. Alluvial soils.

Terrace farming — a result due in part to the lack of lowlands and in part to the population pressure — is a method to check soil erosion

3. Volcanic soils.

Laterites

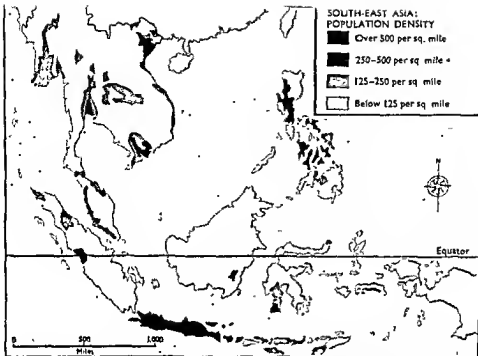
These develop from any rock but specially from granites. The uniformly high temperatures experienced in South-East Asia result in a very rapid rate of decomposition of organic matter which hinders the development and accumulation of humus. Furthermore, the high annual rainfall washes the soil nutrients into the lower layers of the soil. This process is called leaching, and intensive leaching results in a soil generally deficient of plant nutrients and consisting mainly of iron and aluminium compounds which give the soil a yellowish or reddish colour. A characteristic of laterites is a pan of iron-oxide which exists near the surface. The true laterite is infertile and is of no agricultural value.

Not all leached soils are true laterites. Some are only partially leached, but tropical red and yellow earths are often commonly grouped as lateritic soils. Though infertile, their agricultural value can be restored by the application of fertilisers as in West Malaysia for the cultivation of rubber.

Though laterites and its associated soil types cover a greater part of South-East Asia, the general infertility of South-East Asian soils is broken by the existence of the other two major soils.

Alluvial soils

These occur along the lower courses and deltas of the rivers. Alluvium is a mixture of soils and is very fertile. Though leaching does take place, the periodic flooding by the rivers brings a new layer of silt. This helps to replenish the fertility of the soil. It is in such areas that agriculture is well-developed and where the majority of the populations are concentrated.



Volcanic soils

The fertility of volcanic soils depends on whether they are acidic or basic in character. Where the volcanic material ejected is acidic, it weathers into infertile soils. Where, however, the ejecta is basic its decomposition results in highly fertile soils. Volcanic out-pourings of lava and ash, extensive in areas of Java, Bali and Lombok and parts of the Philippines, are of the basic type. This accounts for such high population concentrations in these areas. Though Sumatra also receives basic volcanic materials, much of the volcanic ejecta are of the acid type.

Minor soil types

There are minor soil types which occur throughout South-East Asia. These include the limestone soils which are found on the sedimentary limestones in eastern Java, Pulau Langkawi in West Malaysia and the Korat Plateau in Thailand. Such soils are

generally infertile. Sandy soils may be found on the coastal plains. These occur as 'bris' along the east coast of West Malaysia. Such sandy soils are infertile.

Soil erosion and agriculture

Soil erosion develops its full force when the vegetation cover is removed. In South-East Asia, where rainfall occurs in torrential showers, the removal of vegetation results in severe erosion of the top-soil. Where the slope is gradual, soil erosion is not so severe as on steep slopes. Deep gullies are carved out by running water and continuous erosion results in a surface bare of soil which is of no importance to agriculture.

The soil washed down tends to silt up the lower courses of the rivers which thus increases the danger of flooding.

In South-East Asia, where agriculture is predominant, it is of prime importance that soil erosion is checked. As population grows, more and more land would be cleared

for cultivation and therefore the greater the danger of soil erosion. Methods like terracing and contour hunding have been employed by the farmers of the Philippines, Java and West Malaysia as ways to check and minimize the rate of soil erosion. Cover crops and green manure are also grown on plantations to counter the devastating effects of soil erosion.

Distribution of Population

The population in South-East Asia is not evenly distributed. There exist, at one extreme, areas with densities over 1,500 per square mile, and on the other end, areas which are sparsely populated or totally uninhabited. The pattern of population distribution in South-East Asia is closely related to agriculture.

For reasons of soil, water supply and relief, agriculture is intensively practised in the lowlands and deltas of South-East Asia. Sedentary agriculture, especially the cultivation of wet padi, is able to support a high population density. It is in such areas where the physical environment has been conducive to agriculture that the majority of South-East Asia's populations are concentrated. These correspond to the large populations of the valleys of the Irrawaddy, Chao Phraya, Mekong, Salween, Sittang and Red rivers, the fertile coastal plains and the areas of fertile basic volcanic materials, especially in Java.

It is also in these areas that the greatest development in agriculture and the overall development of the economy have taken place. These have served to concentrate further the people in these areas.

The major cities and capitals are also situated in these areas of high population densities. The urban facilities have in most cases attracted population from other areas,

thus augmenting the population numbers and densities.

Shifting agricultural practices do not support a large population. Such areas, therefore, have low population densities. Inaccessibility, rugged relief and poor soils also account for low population densities. Thus the interiors of Borneo, Burma and the other mainland states are areas of low population densities.

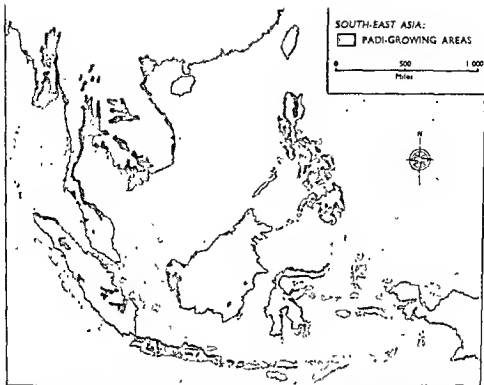
Although the pattern of population distribution is mainly determined by agriculture, minerals have also played a decisive role in the distribution of population in South-East Asia. The presence of tin in West Malaysia, for example, has resulted in a heavier concentration of people along the west coast of the country. The same role is played by oil in Borneo, Burma and Sumatra.

Primary Production

The primary industries of agriculture, fishing, forestry and mining dominate the economies of South-East Asian countries, providing the main sources of export earnings as well as employment. Of these, agriculture is by far the most important both in terms of value of exports and employment. There are, of course, variations from this generalised pattern. In Sabah, for example, timber exports far exceed that of the main agricultural export, rubber. But here, in terms of employment, the timber industry employs significantly less people. Agriculture, too, has played an important role in the pattern of distribution of the population.

AGRICULTURE

Agriculture is of prime importance in South-East Asia, be it commercial or subsistence in nature. Most of the economies



hinge on the production of one or two major agricultural products. In West Malaysia, rubber accounts for some 60% of the country's total export earnings.

Geographical factors of climate, soil, relief and water supplies partially account for this dominant position of the agricultural sector. Historical factors, too, have played their part by way of migrations and colonisation both of which introduced into this region new crops and ideas in agriculture.

Broadly three types of agricultural systems exist. They are:

1. Shifting cultivation.
2. Subsistence farming.
3. Commercial agriculture

SHIFTING CULTIVATION This type of agriculture is transitional between food gathering and hunting and sedentary agriculture. A clearing is made by cutting and burning

the trees of the forest, after which crops are grown. With the depletion of soil fertility after two or three harvests, the clearing is abandoned and the vegetation allowed to regenerate. The land now lies fallow. It needs as long as a 20-year cycle for natural reafforestation to take place. If population numbers remain small the effects of shifting cultivation would not be keenly felt. But once over-population steps in, the fallow period has to be reduced. The natural cycle of the forest growing back and replenishing the soil fertility is disrupted with more clearings for cultivation. The soils are quickly exhausted. Soil erosion becomes increasingly prevalent with exposed surfaces, especially on hilly terrain.

SUBSISTENCE FARMING This entails the production of crops solely for the farmer's own use and consumption. A variety of crops are planted in addition to a main crop which,



To-day oil-palm has become an important cash-crop in West Malaysia. The picture above shows a young oil-palm estate in Johore.

in most cases, is wet padi. Subsistence farming is an important feature of South-East Asian agriculture. Cultivation takes place in small farms and much of the farm work is done with the minimum amount of machinery, the labour being supplied mainly by the farmer and his family. Farming is largely dependent on rainfall, the annual cycle of activities being closely geared to the wet season of the year. This makes the farmer's lot dependent on the vagaries of the weather.

In almost all South-East Asian countries, the farming sector forms an important section of the population. Various steps have been taken by the individual governments to help raise the standard of living among the rural masses. Towards this aim, settlement schemes have been initiated, drainage and irrigation works built, and more modern utilities and services to the rural sector provided.

Subsistence crops include padi, vegetables and maize.

COMMERCIAL AGRICULTURE Along with European colonization came the introduction of large-scale commercial cultivation of crops including rubber, oil-palm, sugar-cane and

padi. In West Malaysia, rubber became the most important cash crop and in the Irrawaddy delta, mono-culture of padi began with British rule.

Cultivation of cash crops takes place in two types of holdings — estates and small-holdings. In estates, agriculture is carried out along scientific lines and with heavy capital investment to ensure high yields and high quality products. In contrast, poorer yields and quality are obtained from small-holders. Very often, cash crops form only a part of a variety of crops that the smallholder grows.

FISHING

The importance of fish in the diet of South-East Asian peoples and the intensive fishing of the shallow coastal waters of the region have already been noted. Besides, fishing also takes place in the rivers, ditches, canals, swamps, ponds and padi-fields. Yet the production of fish and the average annual production per fisherman are small compared with the totals for British fishermen. For example, a West Malaysian fisherman lands an annual average of 2½ tons whilst the British fisherman has an average of some 8 times more.

The mechanisation of fishing boats and the introduction of modern fishing craft for deep-sea trawling are steps to increase the output of South-East Asian fishermen.

Efficient transport is necessary in order that the fish will arrive fresh at the market. Refrigeration enables the fish to be kept fresh for a longer time. But for most of the fishermen, their catch is dried or salted before being sold locally or exported to other parts of South-East Asia.

MINERALS AND MINING

A variety of minerals exist in South-East

Asia which are associated with the older rocks of the region. These minerals include tin, iron, gold, silver, lead and deposits of coal and gems. For the most part, these are of secondary importance, deposits being small or inaccessible.

The world's largest known deposits of tin stretch in a belt from Yunnan to the Sunda Shelf. Within this belt, the tin exists both as lode and alluvial ore, but it is the latter, which stretches in a broad zone from Tenasserim in Burma, through western West Malaysia to the islands of Bangka, Belitung and Singkep, that accounts for the greater part of the region's tin output. The accessibility of these alluvial ores accounts for its greater output.

Petroleum is also mined in South-East Asia. In contrast, these deposits are found in the younger rocks of the region. Occurring in central Burma, the oilfields continue into Sumatra and northern Java, where the line divides into two, one extending along southern, northern and eastern Borneo, and the other continuing through Seram to West Irian.

In recent years, the total value of petroleum produced has exceeded that of tin. Oil

production is declining in certain areas and new deposits have to be found if the industry is to maintain its present level of output.

South-East Asia cannot be considered rich in mineral wealth, and in many areas, mining activities and production are declining. Nevertheless, minerals have influenced the pattern of population distribution in the region. Minerals have served to attract population, for example, to the bleak and remote areas of Burma's Shan Plateau, or the jungles and swamps of Borneo.

TIMBER PRODUCTION

The forests of South-East Asia have been exploited in varying degrees. One drawback is the great number of tree species in any forest area. This makes timber exploitation uneconomical.

The more open and homogeneous forests of tropical monsoon South-East Asia have been more systematically exploited. These are the forests of Burma and Thailand which produce valuable teak wood.

Small-scale exploitation of other forest products is carried out throughout the region, and some trade has developed in such products as gums, rattan and jelutong.

EXERCISES

1. Outline briefly the relationship of relief and drainage to structure in South-East Asia as a whole.
2. Compare and contrast the climate of mainland South-East Asia with that of insular South-East Asia.
3. Write an essay on the climate of South-East Asia, paying special attention to the monsoonal wind system. Illustrate your answer with sketch-maps.
4. Outline briefly the major soil types found in South-East Asia and show how they limit agricultural development.
5. Describe and account for the distribution of population in South-East Asia.
6. Explain with the aid of a sketch-map, the chief factors which influence the climate of South-East Asia.

Chapter 2

West Malaysia: Relief and Drainage

On 16th September, 1963, the Federation of Malaysia was formed comprising the Federation of Malaya, Sabah, Sarawak and Singapore. In August 1965, however, the State of Singapore separated from Malaysia to become an independent republic.

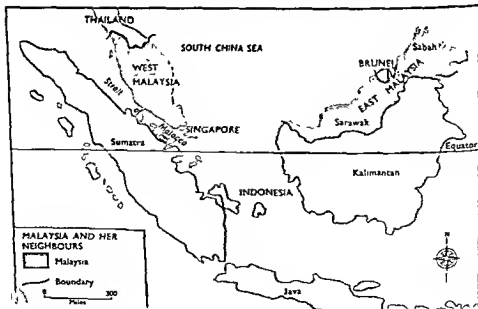
The Federation of Malaysia, with an area of about 130,000 square miles, occupies two different regions, the Malay Peninsula and the north-west coastal region of the island of Borneo. The former is now known as West Malaysia; the latter, made up of the States of Sabah and Sarawak, is called East Malaysia. A distance of 400 sea miles separates the two "halves" of Malaysia, yet it is true that in South-East Asia it is "the land that divides, and the sea that unites". Bonds of common stock, religion, government and problems of development link

the two divided regions.

Malaysia occupies a strategic position in South-East Asia, for it is part of both insular and mainland South-East Asia. To the north it shares a frontier with Thailand. The Strait of Malacca separates West Malaysia from Indonesian Sumatra. East Malaysia has a 900-mile long frontier with Kalimantan. To the north-east of Sabah lie the islands of Palawan and Mindanao which are part of the Republic of the Philippines.

WEST MALAYSIA

West Malaysia, formerly Malaya, occupies the greater part of the long and slender peninsula in the southernmost part of Asia.



It extends from latitude $1^{\circ} 20'N$ to latitude $6^{\circ} 40'N$. The country is bounded in the north by Thailand, in the west by the Strait of Malacca and in the east by the South China Sea. To its south lies the Republic of Singapore, which is separated from the peninsula by the narrow and shallow Strait of Johore. A three-quarter mile long causeway joins Singapore to West Malaysia. The total area of West Malaysia is about 52,000 square miles. Its length from north to south is about 500 miles, and its greatest width from east to west is about 200 miles.

Relief

THE HIGHLANDS

The relief of West Malaysia is dominated by seven major ranges which are roughly parallel to one another and have a north — south trend. The highest levels of these ranges vary from 4,000 to 7,000 feet above sea level. By world standards, they are not very high ranges, and they do not form real climatic barriers between the eastern and western parts of the peninsula. They also create physical difficulties in east — west communications, so that the major lines of communication tend to take a north — south direction.

The major mountain or hill ranges are:

1. *The North-Western Range* or Kedah-Singora Range, which stretches from Singora in Thailand to western Kedah. It is a low and discontinuous range, with several outlying or detached portions. The main outliers are Gunong Perak, Kedah Peak and the island of Penang.
2. *The Bintang Range*, which extends from Thailand through Perak as far as the town of Bruas. This is a high range dominated by Gunong Bintang (6,103 ft.). It lies to the north-west of the Perak river.

3. *The Kledang Range*, an offshoot of the Main Range, which lies between the Perak river and the Kinta river.

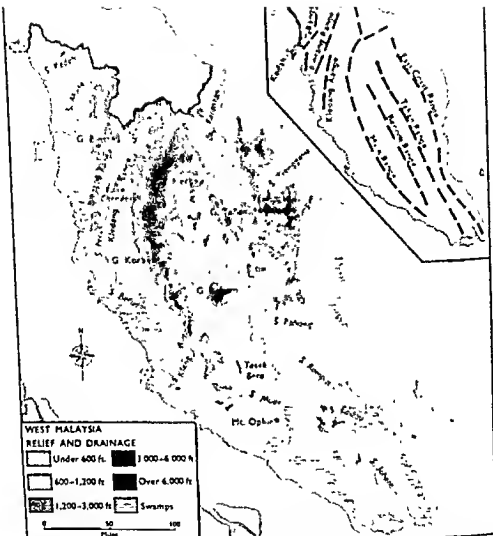
4. *The Main Range*, which is the longest and most continuous mountain range in West Malaysia. It extends in an arc from Thailand to Malacca. Its length from north to south is about 300 miles, and its width is 30–40 miles. In the north it occupies a central position in the peninsula, but its central and southern parts lie well towards the western side of the peninsula. The northern half of this range is much broader than the southern half. There are several high peaks on the range, the highest being Gunong Korbu (7,162 ft.).

5. *The Benom — Mt. Ophir Range*, which lies to the south-east of the Main Range. Its continuity has been broken by streams flowing from the Main Range, and its central portions are so low that the range as a whole is hardly visible in an ordinary atlas map. Mt. Ophir, the southernmost point of this range, is situated near where the boundaries of Malacca, Negri Sembilan and Johore meet.

6. *The Tahan Range*, which takes its name from Gunong Tahan (7,186 ft.), the highest mountain peak in West Malaysia. Gunong Tahan is in the north of Pahang, near its border with Kelantan. The Tahan Range, whose continuity is broken by the Pahang river and the Rompin river farther south, stretches southwards through central Johore to Singapore.

7. *The East Coast Range*, which stretches from Kelantan through Trengganu to the south-east of Johore. In Pahang and eastern Johore the range is in the form of granite hills and ridges, some of which rise above the swamps.

The Trengganu Highlands is a term referring to a large highland area situated



in the north-east of the peninsula and consisting of a huge mass of mountains, hills and foothills. The Trengganu Highlands include the northern parts of the Benom Range, the Tahan Range and the East Coast Range. They occupy large parts of southern Kelantan and Pahang as well as Trengganu. They form a huge mountainous mass with deep and narrow valleys carved by rivers.

The mountain and hill ranges of West Malaysia are composed mainly of granite. The Tahan Range, however, is composed of sedimentary rocks. The other ranges were once covered by sedimentary rocks, but weathering and erosion in the course of millions of years have removed their sedimentary covering, subdued their relief and exposed their granite cores.

Among the hills and ridges composed

of sedimentary rocks are many limestone hills (limestone is a sedimentary rock), especially in the northern and central parts of the peninsula. The limestone hills are found among the foothills of the ranges or stand isolated in flat alluvial areas. On the Thailand-Perlis border there is a ridge of limestone, along which are big hollows surrounded by vertical limestone cliffs. Some caves on this ridge have deposits of tin-ore. North of Kuala Lumpur (at Batu) there are limestone hills with steep cliffs, where the famous Batu Caves are visited by many people. The limestone hills of West Malaysia are of various heights, ranging from a few hundred feet to more than two thousand feet.

THE LOWLANDS

The mountainous and hilly interior of the peninsula occupies much of the land surface of the country, leaving only about half the total area in the form of lowlands below 500 feet in height. On each side of the mountainous core there is a coastal plain. Besides the two coastal plains, there are large areas of flat or undulating land in the southern part of the peninsula where the mountain ranges tail off or appear as small ridges or hills separated by wide intervals of lowland.

The *West Coast Plain* is much more extensive than the East Coast Plain. It is a flat alluvial lowland formed by both river and marine action. The average width of this alluvial lowland is 20 miles, but in the lower courses of the Perak river and the Bernam river the alluvium stretches inland for about 40 miles. The alluvial plain extends from the north to the very south, except for a section between Port Dickson in Negri Sembilan and Tanjong Kling north of Malacca town. From Tanjong Kling

the alluvial plain continues southwards as a narrow stretch, which becomes broader along the west coast of Johore. But granite hills and spurs of hills near Muar and Batu Pahat break its continuity.

The alluvial deposits along the West Coast Plain consist mainly of clay with a mixture of sand or peat (a substance produced by decaying vegetation in the first stage of being changed to coal). Their thickness varies from place to place. A maximum of nearly 400 feet has been found by boring at a site in Selangor.

The coastal plain is so low and flat that a large part of it is regularly flooded by high

Part of a limestone outcrop rising abruptly from the flat alluvial plain. Note that parts of its precipitous sides are bare of vegetation



tides. The flooded areas form swamps occupied by mangrove forests. An almost continuous belt of mangrove swamps stretches from the north to the south along the west coast. This almost uninterrupted strip of mud flats and swamps is several miles wide, and in a few places its maximum width is more than 12 miles.

The *East Coast Plain* is narrower and less continuous than the coastal plain on the western side of the peninsula. The widest part is in the delta of the Pahang river, where the alluvial plain is about 20 miles in width. The delta of the Kelantan river and the combined delta of the Rompin-Endau rivers are other large flat areas of alluvium. But to the east of the East Coast Range in Trengganu there is only a narrow stretch of sandy beach between the foothills of the range and the sea.

Along the east coast the full blast of the North-East Monsoon, which is unchecked by any large land barrier, and the strong waves and powerful currents flowing off the coast combine to prevent the formation of mud flats and the growth of mangrove forests in muddy areas. Instead, sand-banks or sand-bars and sand-spits have been formed near the mouths of most rivers, for the deposits of sand and silt brought down by the rivers are spread by the waves and currents along the coast. Near the mouths of rivers the sand-bars often change their positions, and this makes river navigation very dangerous. These factors have hindered the development of harbours and ports along the east coast, where there is a serious lack of good harbours and an absence of important ports.

Many of the sandy beaches along the east coast are very broad. Inland, the beaches are backed by a narrow strip of casuarina forest, and often there is a number of long, low

sandy ridges locally called *permatang* running roughly parallel to the coast. Sometimes the series of *permatang* extends several miles inland. The low areas between the *permatang* are often flooded with rain or river water. Such areas carry freshwater swamp forests, some of which have been cleared for padi cultivation.

Drainage

The positions of the three main mountain ranges and mountain masses in West Malaysia, namely, the Bintang Range, the Main Range and the Trengganu Highlands, determine the major drainage lines of the peninsula. Between the Bintang Range and the Main Range flows the Perak river, the second largest river in the country. It drains southwards into the Strait of Malacca. Between the Main Range and the Trengganu Highlands, the Kelantan river flows northwards, and the Pahang river flows southwards and then turns east. The Pahang river is the largest river in West Malaysia. Both the Kelantan and the Pahang rivers flow into the South China Sea.

The high rainfall, well distributed throughout the year, has given rise to a large network of rivers and streams. Although the rainfall of West Malaysia is not as seasonal as that in some other monsoon lands, for example, India, it is often torrential and much heavier during the North-East Monsoon season. The result is that the rivers are often subject to flooding, especially those in the eastern part of the country. In some years these floods have proved destructive to crops and property. Even when the floods are not very destructive, they disrupt the lives of the people when large numbers have to move to higher areas to wait for the floods to subside.

In the upper courses of rivers in West Malaysia the gradients are steep and the flow quick and strong. But in the middle and lower courses the very gentle gradients cause the rivers to flow very sluggishly, resulting in a great deal of meandering and the formation of ox-bow lakes and levees. This sluggish flow of rivers in the West Coast Plain has led to the formation of large freshwater swamps well inland. Large areas of these freshwater swamps and also some tidal (salt water) swamps have been cleared and drained for padi cultivation. But there still remain very extensive areas of swamps on the West Coast Plain.

In the East Coast Plain the blocking of drainage by sandy ridges (permatangs) and sand-bars has led to the creation of freshwater swamps. Many of the smaller streams in the Pahang-Rompin-Endau deltaic region drain into such swamps. Some areas of such swamps have been reclaimed, as in the

West Coast Plain, for padi cultivation.

The rivers of West Malaysia have not been used to any great extent to produce hydro-electricity. Only the Perak river and the rivers at Cameron Highlands have been so used. On the Perak river a power-station was built at Chenderoh, where Lake Chenderoh was created by the building of a dam across the river. The new Cameron Highlands project is a much bigger scheme, with a transmission system supplying electric power to many parts of West Malaysia.

Finally, the rivers of the country, which were the main lines of transport during the previous centuries and whose importance has been reduced with the construction of roads and railways, still retain some of their usefulness as transport routes. But compared with the rivers of East Malaysia, they play a very minor part in the transportation system of West Malaysia.

EXERCISES

1. With the aid of a sketch-map describe the relief of West Malaysia.
2. On an outline-map of West Malaysia, mark and name:
 - (a) the seven major mountain ranges;
 - (b) Gunong Tahan, Gunong Perak, Gunong Bintang, Gunong Korbu and Mt. Ophir;
 - (c) the Pahang, Perak and Kelantan rivers.
3. Compare and contrast the West Coast Plain with the East Coast Plain.
4. Write an essay on the drainage of West Malaysia, paying special attention to the importance of rivers in the country.

Chapter 3

West Malaysia: Climate and Vegetation

Climate

West Malaysia has an equatorial climate which is modified by monsoonal influences. The characteristics of this type of climate are high uniform monthly temperatures, around 80°F, and rainfall throughout the year, but with certain peak periods of heavier rainfall. This is different from the tropical monsoon or temperate monsoon type of climate, where greater seasonal differences of temperature and rainfall are experienced.

The chief factors influencing the climate of West Malaysia are (i) its low latitude of 1° to nearly 7°N (ii) its insularity, for the country is almost surrounded by the sea, and (iii) its position in relation to the path of tropical air masses moving to and fro across the equator. The low latitudinal position results in West Malaysia having uniformly high temperatures all the year round, except where the temperatures are modified by altitude. It is also responsible for the periods of equatorial calm when convectional forces are at work. The insular nature of the country means that the influences of air masses and prevailing winds can reach most parts of the country. The position of West Malaysia in the paths of air streams from different directions causes seasons to depend more on wind reversals than on differences of temperature between prolonged hot and cold periods.

Another climatic factor, itself the result of the low latitudinal position, is the presence of large areas of rainforests, which occupy about three-quarters of the country. The

transpiration of moisture from the dense forest cover helps to increase the humidity of the air and therefore its rain-forming potentiality.

WINDS

West Malaysia is under the influence of several air-streams from mainland Asia, Australia, the Pacific Ocean and the Indian Ocean. They meet in West Malaysia and the rest of insular South-East Asia. The boundaries where they meet occupy different positions during different times of the year. The winds not only bring relief rain to highland areas which lie along their paths, but where the air-streams meet, boundary or frontal rain is likely to result. The two major air-streams which affect the rainfall of West Malaysia most are the North-East Monsoon and the South-West Monsoon. When these two air-streams retreat, air-streams arrive from other directions, or else there are periods of calm.

The influence of the major air-streams and the changing system of prevailing surface winds create a pattern of four seasons in a year. They are:

1. The North-East Monsoon season
2. A transitional period.
3. The South-West Monsoon season.
4. Another transitional period.

The North-East Monsoon season does not begin suddenly and regularly at the same time every year. The monsoon may come in late October or in November, or even as late as early December. Usually the

North-East Monsoon begins to blow in November and becomes established over the peninsula in December. It lasts until the end of March or April. The North-East Monsoon comes in the form of strong winds, as there are no large land barriers in its path, and retreats earlier from the southern part of the country and some time later from the northern part.

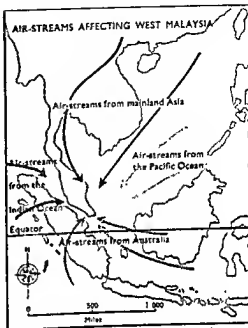
The *transitional period* between the two monsoons begins in April in the southern part of the country and in May in the northern part. For the country as a whole the transitional period lasts from April to May. It lasts for about five weeks in the north and for about seven weeks in the south. This is a period of weak and variable winds.

The *South-West Monsoon* season begins in June and lasts until the end of September or the beginning of October. This monsoon is experienced more in the north of the country than in the region south of latitude 5°N.

In the southern region light southerly winds are more common than the south-westerlies. Both the winds from the south-west and the south are weaker than the north-east winds, as they have to cross large land barriers such as Sumatra and Java, and their pattern may be completely interrupted by breezes along the coastal areas.

The *second transitional period* follows the South-West Monsoon season. It is shorter than the earlier transitional period and occurs generally in October, with a possible extension into early November, just before the arrival of the North-East Monsoon.

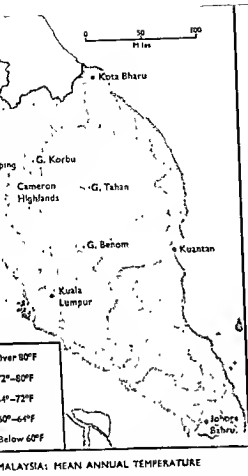
LAND AND SEA BREEZES These daily winds result from temperature contrasts between the land and sea, which are due to the different



rates at which land and water bodies heat up or cool down.

In coastal areas daily land and sea breezes often develop and affect places within 10 miles from the sea. They are stronger and more regular during the transitional periods between the monsoons, and sometimes during the South-West Monsoon season when the monsoon is weak. The sea breezes start in mid-morning, at about 10 or 11 o'clock, become stronger in the afternoon and gradually cease to blow around sunset. The land breezes set in at eight or nine at night and stop blowing the next morning, two or three hours after sunrise.

SQUALLS are sudden storms with wind speeds of over 30 miles per hour. A local squall, usually accompanied by heavy rain, may occur because of some local landform interfering with the passing of an air-stream,



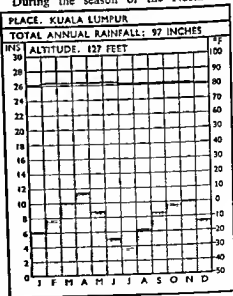
or because of strong convectional currents resulting in the formation of local rain-clouds. A *line-squall* is connected with a long stretch of rain-clouds with strong winds at each point of the stretch. Squalls are most frequent along the southern coastal parts of West Malaysia from May to August. 'Sumatras' are line-squalls which move from the Strait of Malacca towards the west coast between Port Swettenham and Singapore. The lines of rain-clouds are often up to 200 miles long and the strong cold winds often blow with speeds of more than 50 miles per hour. 'Sumatras' usually

occur at night, and they bring very heavy rain. The causes of such line-squalls are not yet known.

TEMPERATURE

The equatorial latitudes of West Malaysia, between 1°N and nearly 7°N, are responsible for the uniformly high temperatures throughout the year. But because of the insular nature of the country, and also because of the heavy rainfall and thick cloud-cover, temperatures are not as high as the summer temperatures recorded in many tropical areas in other parts of the world. The mean monthly temperatures for most months of the year in most lowland places in West Malaysia are between 78°F and 82°F. The effect of altitude on temperature can be seen, for example, on Cameron Highlands where mean monthly temperatures of between 63°F and 65°F are recorded.

During the season of the North-East



Monsoon the eastern part of the country experiences lower temperatures, owing to the heavy rainfall and thick cloud-cover and also perhaps owing to the fact that the north-east stream comes from much cooler latitudes.

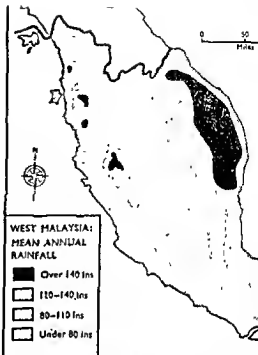
The mean daily range is greater than the mean annual range. Generally the maximum daily temperatures are higher and the minimum temperatures are lower in interior locations than in the coastal areas.

RELATIVE HUMIDITY AND RAINFALL

Relative humidity (or comparative wetness) means the actual amount of water vapour in the air compared with the full amount the air can hold at that temperature, the comparison being stated as a percentage.

In West Malaysia the relative humidity is very high, which means that there is a great potential for precipitation in the atmosphere. At the same time, a high relative humidity combined with a high uniform temperature result in a climate that is enervating. Most lowland areas have a relative humidity of about 85%, while highlands have about 90%. But the maximum relative humidity in all weather stations lies between 95 and 100%.

There are several types of rainfall experienced in West Malaysia. The most important type is *relief* rain, which is caused by the rise of an air-stream over high relief. During the monsoon season the strong winds can be lifted over higher and larger areas and bring more widespread rainfall than other winds and breezes. *Convictional* rain, which is more localised, results from the differential heating and cooling of land at different places. Strong convictional currents may lead to the forming of thick rain-clouds at a small area. A mass of rain-clouds may result in intense showers of rain over an area of between one square



mile and more than 20 square miles. The convictional type of rain generally lasts only for a brief period, usually for 1-6 hours.

Boundary or frontal rain is caused by the meeting of different air-streams with different temperatures and wind speeds. Such convergence of air-streams causes an uplift of unstable and turbulent air and may result in rainfall for a period of several days, usually at the onset of a monsoon season. Then there is the type of rain connected with local *squalls* and *line-squalls*. Very heavy rainfall, lasting for a few minutes or sometimes one or two hours, may occur.

DISTRIBUTION OF RAINFALL

In any part of the world an annual rainfall of over 80 inches is considered heavy and rainfall of 60-80 inches is considered moderate. In West Malaysia more than 90% of the land surface receives more than 80 inches of rainfall a year. But there are large areas with a much heavier annual



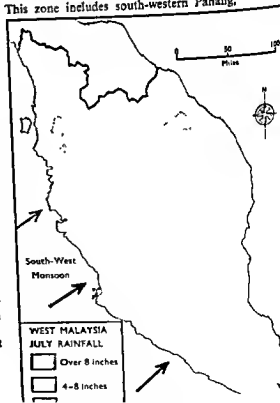
rainfall than 80 inches, and also a few smaller areas which receive moderate rainfall but cannot be called dry areas.

There are two main belts which are very wet. One is the large belt covering almost the whole length of the eastern third of the country. The annual rainfall in this belt is over 120 inches. In the northern part of this belt the annual rainfall is between 130-170 inches. Nearly half of this rain falls during the North-East Monsoon season which lasts for five months. The remainder occurs in the other seven months, which are by no means dry months.

The other belt is in the north-western part

of West Malaysia. It stretches from central Kedah to the lower course of the Perak river, beyond which valley it continues south-eastwards as far as Tanjong Malim which lies some 40 miles north of Kuala Lumpur. This belt covers the higher lands in the northern half of the western region. The southern half is less wet, probably because of the wind barrier provided by the mountains of Sumatra.

On the other hand, there are two main zones where the annual rainfall is less than 80 inches. One is a small strip along the west coast stretching from Lumut (near Pulau Pangkor) southwards to the north of Klang (near Port Swettenham). A larger zone stretches from Temerloh in Pahang southwards to the north-west of Johore. This zone includes south-western Pahang,



the eastern part of Negri Sembilan, the greater part of Malacca State and north-western Johore. Within this zone the Jelebu district in Negri Sembilan has the lowest rainfall of 65 inches, which is moderate in amount. Apart from these wet belts and 'drier' zones the remainder of the country receives between 80-110 inches of rainfall a year.

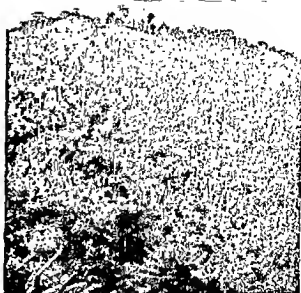
In the distribution of rainfall throughout the year, all the major weather stations, except those in the north of the country, record rainfall of over 4 inches every month. Alor Star and Penang receive less than 4 inches during January and February, which form a distinct drier period, and in Kota Bharu, February is a drier month, with less than 3 inches of rainfall. Stations along the eastern part of the country record heaviest rainfall during November and December. Both Kota Bharu and Kuala Trengganu receive more than 20 inches during each of these months.

Natural Vegetation

About three-quarters of the total land surface of West Malaysia is covered with dense equatorial rainforests. This is the natural response of vegetation to the hot, humid climate of the peninsula. The dense forest cover was much greater before, but the extensive clearing of forests for agriculture and other purposes has served to reduce the extent of this natural forest cover. This is most evident on the western side of the peninsula.

LOWLAND RAINFORESTS

The lowland rainforests cover about 60% of the land area of the peninsula, and may be found on mountain slopes up to a height of about 2,500 feet. Above this they give way to sub-montane forests, which occur










The crowns of the trees in the forest interlock to form a continuous canopy of leaves. The tallest trees protrude from this 'roof' and these can be easily discerned in the horizon.

up to a height of 4,000 feet. Beyond this mountain (montane) forests of oaks and laurels predominate.

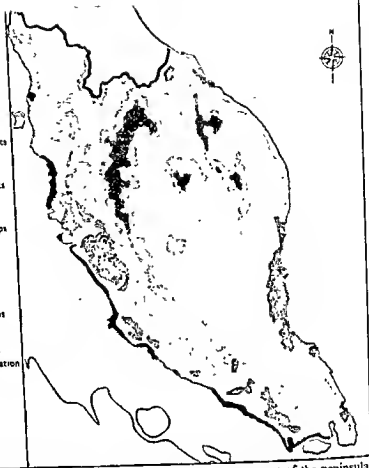
The trees of the lowland rainforests are tall and straight, and the forests are characteristically storeyed in nature. The tallest trees protrude from the 'roof' or canopy which forms the second storey of the forest.



WEST MALAYSIA.
LAND USE

-  Montane forests
-  Sub-montane forests
-  Lowland rainforests
-  Freshwater swamps
-  Beach forests
-  Mangrove swamps
-  Unforested land,
mainly for cultivation
or mining

0 50
Miles



This canopy is formed by the crowns of trees linking together. A third storey of trees exists, beneath which is a layer of shrubs, ferns and small palms forming the undergrowth. There are also large creepers which twine themselves on the trunks of trees and climb towards the upper storeys.

Several thousand species of trees exist in the lowland rainforests. More than 350 species yield useful timber. Among them are several species of hardwood trees, the main species being the *chengal*, *balau*, *kapur*, *keruing* and *meranti*. The strongest and most durable is *chengal*. *Balau* is as hard as *chengal* but is less durable. *Kapur*, which is moderately hard but durable, is found

mainly in the eastern part of the peninsula. *Keruing* is hard but moderately durable, and is fairly abundant. The most abundant of the hardwoods is *meranti*. There are red, white and yellow species of *meranti*. The wood is moderately hard and not very durable, so that it is used mainly for making cheap furniture and other light work. Another species of trees is *jelutong*, the gum of which is used for making chewing gum.

Large areas of rainforests have been cleared for shifting cultivation or for other purposes such as mining. When these clearings were abandoned, secondary forests, locally called *belukar* or *hutan muda*, were

Chapter 4

West Malaysia: Agriculture

From a study of the climate of West Malaysia, one can see that the climatic conditions are suitable for agriculture, for the farmers are not faced with such problems as drought or insufficient supplies of water, severe winter conditions, frost or very short growing seasons. These problems are faced by farmers in many other countries. The uniformly high temperatures and the abundant rainfall, generally well distributed throughout the year are favourable to plant growth during all the months of the year, so that the farmers have a long growing season.

In spite of the fact that highlands and rainforests occupy about three-quarters of the land surface, agriculture occupies a very important position in the economy of the country. It accounts for nearly half the income of the nation, and about 60% of the working population is engaged in agriculture.

Agriculture may be broadly divided into two types: commercial agriculture and subsistence agriculture. Commercial agriculture is the cultivation of cash crops, that is, crops grown for sale within or outside the country. Subsistence agriculture is the cultivation of subsistence crops which are grown for the consumption or use of the cultivators themselves.

The chief crops cultivated in West Malaysia are rubber, rice, oil-palms and coconuts. Rubber and oil-palms are cash crops. Coconuts are mainly a cash crop, and rice is mainly a subsistence crop. Other crops

are tea, coffee, pineapples and other fruits, minor food crops such as tapioca and sweet potatoes, vegetables, pepper and other spices.

Irrigation and Drainage

It seems strange that in a well-watered country such as West Malaysia, large-scale irrigation is necessary. Although there is sufficient rainfall and the rainfall is usually reliable and not too variable, the Government has established the Drainage and Irrigation Department. Its main tasks are (i) to ensure that crops, especially rice, have controlled supplies of water during the growing season; (ii) to provide proper means of draining away excessive water in the fields when it is not needed; (iii) to open up new jungle land for cultivation; (iv) to reclaim swamps and improve coastal farming areas made infertile by sea-water; (v) to maintain and improve the rivers to prevent flooding of nearby agricultural lands, and (vi) to attempt to keep important routes reasonably free from serious flooding. The main aim of the Drainage and Irrigation Department is to increase the country's food production, especially rice, and to improve the standard of living of the farmers.

Rubber

Rubber was introduced into West Malaysia at the end of the last century. Before its introduction, sugar-cane and coffee were the main cash crops. Sugar-cane cultivation declined in the face of foreign competition.

whilst low prices and diseases accounted for the decline in coffee production. At the same time, the rapid development and expansion of the automobile industry resulted in high prices for rubber. Under these circumstances, the cultivation of rubber in West Malaysia was greatly stimulated. Extensive areas of rainforests were cleared. British capital poured into the rubber industry, and workers, mainly from India, were brought into West Malaysia to work in the estates. Asians also took up rubber planting both in estates and smallholdings. Thus in a comparatively short time, rubber was established as the chief cash crop in the country. Rubber's dominant position is apparent from the following facts. Rubber now occupies 4.2 million acres or about 65% of the total cultivated area in the country, and about 60% of the total export earnings are contributed by rubber. Today, West Malaysia is one of the two leading rubber-producing countries of the world, the other country being Indonesia.

Conditions favourable for rubber growing

The geographical and other conditions favourable for the growing of rubber exist in West Malaysia. These conditions are: (i) temperatures of over 70°F throughout the year; (ii) an annual rainfall of more than 80 inches well distributed throughout the year; (iii) good drainage, either natural or artificial; (iv) moderately fertile soils preferably crumbly, deep, well-oxidized and acid in reaction, with the water-table deeper than 3 feet; (v) a large continuous labour force, if rubber is planted on a large scale and (vi) an adequate system of roads and railways with ready access to ports in order to facilitate the sale of rubber to external markets and the transportation of food to the labour force in the estates








The picture above shows young rubber trees growing on undulating land in order to meet the requirements of good drainage. Notice that contour bunding is practised here.

Some of these conditions exist in many areas throughout the country, but it is in the western part of the country that practically all these conditions or requirements have been amply met with. As rubber does not demand very fertile soils and does well on many different kinds of soils, the western part of the country has a variety of soils which suit rubber. The requirement of good drainage is met by planting rubber on the foothills and undulating land between the West Coast Plain and the mountain ranges, and also by draining the flat swampy areas on the coastal plain. In fact, much of the swampy land on the West Coast Plain has been changed into good rubber land by efficient drainage.

The demand for a large labour force, especially by the estates, was met by immigrants from southern India. But it was the existence of a skeleton network of roads and railways, originally laid to serve the tin mines, which helped to attract the rubber planters to the western part of the country. Large clearings in the jungle on both sides of the north-south railway line were soon made. Another important factor was the exis-

WEST MALAYSIA:
DISTRIBUTION OF
MAIN CASH CROPS

-  Rubber
-  Oil-palm
-  Coconut
-  Pineapple
-  Forests and other forms of land use



tence of ports and large towns, with their concentration of European and Chinese businessmen and commercial houses. The western part of the country was within reach of the immigrant businessmen and had easy access to the port facilities of Penang, Port Swettenham and Singapore, which handled the export of rubber and the import of labour and materials.


Distribution of rubber

Rubber occupies 42 million acres or


about 65% of the total cultivated area in the country. The rubber estates which were developed in the early years occupied sites on the slopes of foothills and well-drained undulating lowlands in the western part of the country. But later they spread to swamp areas which had been reclaimed. Thus most of the rubber estates came to be located in a broad belt in the west, stretching from Kedah to Johore. This belt, called the 'Tin and Rubber Belt', is broad in the north, but thins out in southern Perak and northern Selangor, then



Formic acid is added into the tank to coagulate the latex.



Aluminium separators are let down into the tank so that the latex coagulates into sheets.



Examining the rubber sheets before they are packed

broadens again farther south, right to the tip of Johore. Its width varies between 5 and 40 miles and it covers not only the western foothills of the mountain ranges, but also the coastal plain and former inland fresh-water swamps. The estates and small-holdings in Johore occupy the greatest acreage. Johore is thus the most important rubber-producing state. Next in order of importance are Perak, Selangor, Negri Sembilan and Kedah. The less important rubber-producing states are Malacca, Pahang, Kelantan, Trengganu, Penang and Perlis. The eastern states produce comparatively little rubber, their combined production being less than that of a single important western state, such as Negri Sembilan.

Methods of production and processing

About 55% of West Malaysia's total output of rubber is produced in large estates, and 45% in smallholdings. An estate is a holding of 100 or more acres, and a smallholding is one of less than 100 acres. Estate sizes of 1,000-2,000 acres are the most common, followed by those of 2,000-5,000 acres. Most of the larger estates belong to European companies. Of the smallholdings, about 90% are less than 15 acres in size. About 50% of the smallholdings are owned by Malays, and 30-40% belong to Chinese smallholders.

The estates rely mainly on Indian labourers (about 50%) and Chinese labourers (30%). The smallholdings, especially the smaller units, depend mainly on family labour. The workers tap the trees once a day or once every two to four days. The latex is collected each day from the latex cups and taken in pails to the estate factory to be processed. It is put into tanks and coagulated, or thickened, by the addition

of acetic or formic acid. Each tank may have several dividers or separators to separate the coagulated latex into thick slabs. The slabs are passed through rollers which press them into thin ribbed sheets. The rolled sheets are then hung on frames in a smoking shed to be smoked. In estate factories some latex is passed through a creping machine and the crepe sheets are air-dried in a drying shed. The ribbed smoked sheets are of a dark amber colour, while the crepe sheets, which are largely used in making the crepe soles of shoes, are of a pale yellow colour. Some estates do not prepare all their latex in sheet form, but remove the water in the latex and add ammonia to preserve the concentrated latex. This liquid latex is mostly exported to foreign countries where it is used in making foam rubber mattresses, surgeons' gloves and other goods. A new way to prepare rubber for export is to make it into the form of crumbs called *Heveacrumb* rubber. This involves the use of expensive machinery and is being carried out only to a small extent.

Problems of the rubber industry

The main problem at present is the low prices obtained for the product, owing mainly to the competition of synthetic rubber

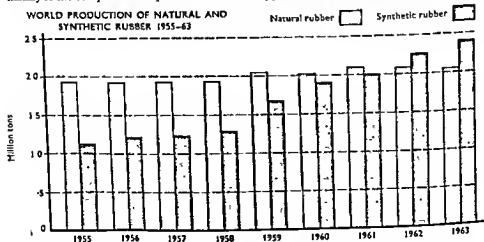
which is made from petroleum, coal, alcohol or other materials. The prices of natural rubber have fallen so low that many estates have found it difficult to continue production. To meet the problems of low prices and competition from synthetic rubber, rubber planters have tried to lower costs of production by increasing output through the planting of high-yielding trees, and by improving the quality of natural rubber. The Rubber Research Institute in Kuala Lumpur has tried to find new uses for rubber and to publicise these uses.

Another problem of the rubber industry is the need to replace a large proportion of the trees which are very old with new ones of high yield. The Government has laid a special tax on exported rubber, and the money raised is used to help pay the cost of replanting trees in smallholdings as well as in estates. Several hundred thousand acres have been replanted since the scheme was started.

Padi

The second most important crop in West Malaysia in terms of acreage is padi. It occupies a much smaller total area than rubber, only about 18% of the total cultivated area in the country, as compared with rubber's 65%. But padi is the chief food crop,

WORLD PRODUCTION OF NATURAL AND SYNTHETIC RUBBER 1955-63



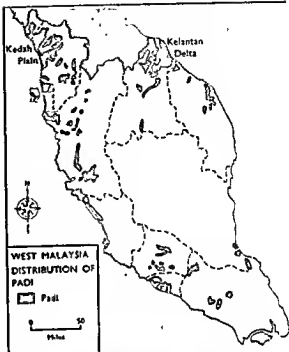
and as such, its importance far exceeds that of other food crops. The total acreage under padi is 980,000 acres.

Rice is the staple food of the people of the country, but West Malaysia used to produce only about one-third of the country's needs, so that the other two-thirds had to be imported from Burma and Thailand. But several times in the past foreign rice was either very expensive or difficult to obtain. The Government has therefore taken steps to extend the padi-growing areas and improve the production of padi. Now nearly 70% of the total needs of the country are met from local production, and the remaining 30% are imported.

Unlike rubber, which is grown mainly by Indian and Chinese labour, padi is planted almost entirely by the Malays. About 96% of those engaged in growing padi are Malays, and only about 2% are Chinese, the remainder being Indians and others. Padi is grown mainly as a subsistence crop, and partly as a cash crop. Farmers in Kedah and Perlis keep about half their crop for their families' consumption and sell the other half, but in other parts of the country farmers consume about two-thirds of their crop.

Distribution of padi areas

The major padi-growing areas are in the northern part of the country, north of latitude 4°N. Over 70% of the padi produced in West Malaysia comes from the north-western and north-eastern sections of the country. In the north-west a broad belt extends from Perlis in the north to the Krian district of Perak in the south. In the north-east the coastal plain in and around the delta of the Kelantan river is another large padi-growing area. In Trengganu padi-growing is important around



Kuala Trengganu and around Kuala Besut in the north of the state near the Kelantan border.

South of latitude 4°N large padi-growing areas along the coastal plain of Perak and Selangor have been developed in connection with irrigation schemes carried out by the Government. One such area is in the lower basin of the Perak river. Another large scheme is in the Bruas-Sitiawan plain in Perak. In Selangor a large area between the Bernam river, which forms the boundary between Perak and Selangor, and the Selangor river has been reclaimed from large swamps for padi cultivation. Other smaller padi-growing areas are along the coast of Malacca and around the delta of the Endau river



Ploughing of the fields is done with the aid of buffaloes. The field is slightly flooded to make the ground soft. This makes ploughing easier

between Johore and Pahang.

The minor padi-growing areas, where padi is entirely a subsistence crop, are found in many inland valleys, on undulating country and in foothill regions. Small fields of this type are found in the inland parts of Negri Sembilan, Malacca, Selangor, Perak, central Pahang and Trengganu.

The main padi-growing states are, in order of importance, (i) Kedah, (ii) Kelantan, (iii) Perak, (iv) Perlis and (v) Trengganu, with Perlis and Trengganu together having a total acreage equal to

Transplanting of the padi seedlings is a back-breaking task done mainly by the women. Compare the water level shown in this photograph with that shown in the photograph above. Why should there be a difference?



that in Perak, the third most important padi-growing state. The other states are much less important. They are, in order of importance, (vi) Selangor, (vii) Pahang, (viii) Penang, including Province Wellesley, (ix) Malacca, (x) Negri Sembilan and (xi) Johore. Johore is more important for cash crops such as rubber and oil-palms.

Climatically, almost all the lowland areas in West Malaysia may seem suitable for the cultivation of padi, as they have temperatures well above the minimum of 60°F and an annual rainfall of more than 70 inches. But not all lowlands have the right type of soil for padi growing. The alluvial soils of the western coastal belt are mostly suitable, as they have a high clay content and are therefore impervious to a large extent. Impervious soils are necessary for the flooding of padi fields during the growing season.

However, the climate of West Malaysia is not really ideally suited to the cultivation of padi, as there is rain throughout the year in most parts. Only in the north is there a distinct drier season needed by padi in its ripening stage. South of 4°N latitude the climate is too equatorial for very successful padi growth. This fact partly explains why over 70% of the rice produced in West Malaysia is grown in the north-western and north-eastern sections of the country.

Cycle of activities

Generally the cycle of activities is the same throughout the country. But variations in the period when each operation takes place do occur — a result of variations in the rainfall regime

Broadly, the cycle involves:

1. The repair of bunds which keep the fields flooded during the growing season.

- It is important, therefore, that the bunds do not break.
2. Slight flooding of the fields to make the ground soft.
 3. Ploughing of the land with the aid of buffaloes, after which the top-soil is raked several times to ensure that all the weeds are destroyed.
 4. Preparation of the nursery which is usually located on dry land.
 5. Sowing seeds in the nursery. At the same time the main fields may be manured.
 6. Transplanting of the padi seedlings into the main fields which at this time are flooded either by rain or by irrigation water.
 7. Weeding of the fields to ensure the successful growth of the padi plants.
 8. Draining the water off the fields as the padi begins to ripen.
 9. Harvesting when the padi has ripened. This is usually done with a tui or sometimes with a sickle.
 10. Threshing and winnowing of the grain.
 11. Storage of the grain either in sacks or rice bins.

Irrigation and Drainage

Apart from natural supplies of water from rainfall, water control in the form of irrigation and drainage schemes is necessary to lessen the risk of crop failure in padi cultivation. The Government has, during the last forty years, added more than a quarter million acres of padi land by carrying out many large-scale irrigation and settlement schemes. These schemes have also provided controlled supplies and drainage of water in older areas of cultivation. Altogether more than 40% of the total area under padi is provided with modern means of water control. Previously many



The picture above shows harvesting of the ripened padi. The sickle is used to harvest the padi stalks.

farmers depended on small and flimsy dams built across streams and constructed of tree trunks, bamboos and stones, or used water-wheels to lift water from large rivers. These devices were easily destroyed in floods. Other farmers depended on local rainfall to flood their fields. With such primitive methods of irrigation or with rainfall as the only source of water supply, the farmers often had poor crops or even experienced crop failures.

But modern irrigation and drainage could ensure that just after the padi seedlings

Threshing is done after harvesting. The woman is beating a bundle of padi stalks against the sides of a wooden tub to separate the grains from the stalks.

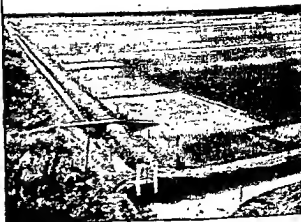


are transplanted, there is about 2 inches of water covering the fields, and that this amount is increased to 4 inches when the plants are taller, and further increased to 8 inches when the padi plants are reaching their last stage of growth. On the other hand, the water must be drained off when the grains begin to ripen. Heavy rain at the ripening stage may bring much unwanted water, and proper drainage would enable this water to be got rid of.

Modern irrigation and drainage schemes, however, are very expensive, and the Government has several such schemes and settlement schemes to complete before extending the schemes to the older areas of padi cultivation. The modern irrigation schemes, such as the \$204 million Muda River Scheme, are intended to enable farmers to grow two crops of padi a year.

Other problems

There are other problems faced by the Government in its efforts to increase the production of rice. One is the problem of persuading farmers to use more manure or fertilisers. Regular manuring with bat guano is practised mainly in Kedah and Province Wellesley. In other padi-producing areas the farmers are unwilling to undertake regular manuring, unlike the farmers of China and Japan. They are generally satisfied with their moderately high yields. The yield per acre in West Malaysia is, in fact, among the highest in South-East Asian countries. But in areas with poorer soils, for example in many east coast areas, the use of manure or fertilisers would greatly improve the very poor yields obtained. One reason for the unwillingness of farmers to use fertilisers is the shortage of ready cash to buy them. But the Government is making efforts to popularise the use



Modern irrigation and drainage ensure a better rice harvest. The water level in the field is controlled by the small sluice gate in the foreground.

of fertilisers, and this has resulted in a gradually increasing use of them throughout the country.

Another problem is that of persuading farmers to plant two crops of padi a year. This is possible where modern irrigation works provide ample water during two growing seasons a year. But double cropping would mean that farmers who are engaged in fishing or looking after their rubber smallholdings during the off-season would have to forgo these more profitable occupations. When the price of rubber was much higher than it is now, an acre of rubber provided a much greater income than an acre of padi. But with the likelihood of rubber prices continuing to be low, padi farmers may become keener to double crop.

The foregoing account of padi cultivation in West Malaysia deals only with the growing of wet padi. The growing of dry padi is relatively unimportant except in Kelantan and Trengganu. In Trengganu about one-fifth of the total acreage under padi is devoted to the dry type, and in Kelantan only about one-seventh of the cultivated land is similarly used.

Oil-palms

West Malaysia is now the world's largest producer of palm oil and palm kernels, having outstripped West African countries in the production and export of oil-palm products. Within the country the oil-palm is the third most important crop in cash value, after rubber and rice. In acreage it is fourth, after rubber, rice and coconut.

The climate of West Malaysia is suitable for the cultivation of oil-palm. The crop, introduced from West Africa, needs high temperatures and an annual rainfall of over 60 inches, well distributed throughout the year. There must not be a long dry season, as poor yields are obtained during such dry seasons, and the yields are high when there is heavy rainfall. The crop does well on a number of different soils, but grows best on alluvial loamy soils, such as those in the west coast alluvial belt and in river valley alluvials. However, it needs good drainage when grown on alluvial flats.

In West Malaysia the acreage under oil-palm has increased to over 260,000 acres. The crop is grown in large estates of between 1,000 and 5,000 acres, which are owned by European companies and worked by Indian labour. It is not grown in smallholdings, as the smallholders cannot afford to buy the expensive machinery needed to process the nuts immediately after they are cut from the trees.

The oil-palm estates are found mainly in Johore, Selangor and Perak. In Johore the estates occupy 45% of the total oil-palm acreage in the country. They are located around Kulai, Kluang, Labis and Layang Layang. In Selangor there are more estates, but these are of smaller sizes. The estates are located on the coastal flats between Batu Laut and Kuala Sepang, to the south



of Port Swettenham. Other districts include the Batu Tiga area between Klang and Kuala Lumpur, and the upper parts of the Selangor river. In Perak, oil-palm estates are located in the middle and upper parts of the Bernam river and south of the mouth of the Perak river.

There are also some estates in Negri Sembilan, Pahang and Kelantan. In Negri Sembilan they are in the Kuala Pilah district,

and in Pahang and Kelantan the estates are at the Pahang-Kelantan border. The various oil-palm estates occupy either the low and gentle slopes of hilly land or river valleys and non-swampy and well-drained coastal flats. In all of them careful drainage is maintained.

As the estates are large and the nuts have to be taken immediately to the estate factory to be processed, there is in every estate a good system of transportation, consisting of laterite roads, light trains or tram-cars, or small boats along drainage canals. When the nuts are speedily processed after cutting, the oil will have a low fatty acid content. In the estate factory there is expensive heavy machinery to process the nuts. The nuts, which have been harvested when they are just ripe, are first steamed and sterilised to prevent the fatty acid from increasing. Then the oil from the pericarp is extracted by machinery. The pericarp is the outer fleshy part of the nut. The pericarp oil is then purified. The shells containing the kernels or seeds are next separated from the outer pulp. They are cracked open and the kernels removed. The kernels are dried to prepare

The worker is holding the remains of the pericarp of the oil-palm fruit from which most of the oil has been extracted.

them for export to other countries where they yield another type of oil under pressure. The kernel oil is used for making lubricants as well as margarine while the oil from the pericarp, called palm oil, is used in making margarine, soap and cooking oil. The palm oil is not put into barrels, but carried in bulk in lorry tankers to the railway stations or ports. There are special railway tankers to carry the oil.

The palm oil of West Malaysia has a very low fatty acid content, very much lower than the palm oil produced in West Africa. On account of this high quality it commands a higher price and is in fairly great demand, especially in the United Kingdom and the United States. The total palm oil production is about 210,000 tons, and the production of kernels is 47,000 tons a year. Apart from a few thousand tons of palm oil used in the country, the whole output of palm oil is exported. More than half the kernels are now processed into kernel oil in the country, and the rest are exported.

Coconuts

In acreage coconuts are third in importance among the crops of West Malaysia, after rubber and rice. But in terms of their cash value, coconuts are a less important crop than oil-palms. Apart from the small number of coconut trees found growing in almost every kampong throughout the country, there are large estates and many smallholdings where the crop is grown on a large scale. About 75% of the total coconut acreage is owned by smallholders, most of whom are only part-time workers in their holdings. The large estates form only about 25% of the total acreage under coconuts. Most of the estates are over 1,000 acres and are owned by Europeans

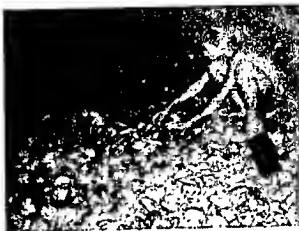


and worked by Malay labour.

Johore is the most important coconut-producing state, followed by Selangor and Perak. This order of importance is the same as that for oil-palm. But while Johore has mainly smallholdings, there are many more large estates in Perak and Selangor than in Johore. Penang and Province Wellesley also have many estates. There are also coconut estates in Trengganu and Pahang. These and all the other states, too, have many smallholdings.

The coconut estates and smallholdings are mostly located along the coastal belts, both western and eastern, with the majority concentrated along the western belt. On the west coast the main coconut-producing areas are: Penang and Province Wellesley; the Krian district of Perak, the Dindings area near Pulau Pangkor and the Bagan Datoh district near Kuala Perak; the whole coastal area of Selangor; and the west coast of Johore. The east coast of Johore, the coast of Pahang and a long coastal strip from Trengganu to Kelantan are the main coconut-producing areas of the east coast.

The coconut palm prefers a light sandy soil. But it can also flourish in inland areas and in heavy, clayey soils which must, however, be carefully drained. The climate of West Malaysia is suitable for the growing of the coconut, as it has a high temperature and a heavy rainfall well distributed throughout the year. In seaside locations the crowns of the palms benefit from the moisture brought by the sea breezes, but in inland locations sufficient rainfall and good drainage also suit the coconut. In fact, in estates along the coast the salt water brought by tides has to be countered by the building of sea-bunds with water-gates to keep out the sea-water at high tide,



Coconut kernels being dried in a smoke-kiln
Copra produced in this way is of a better quality

and to allow inland water to be drained off during low tide.

The large estates are mostly owned by Europeans and worked by Malay labour. In the estates the coconut 'meat' or kernels are dried in smoke-kilns, and the husks are used as fuel in the kilns. In smallholdings the kernels are dried in the sun. Kiln-drying produces better-quality copra than sun-drying.

Coconut oil, similar to palm oil, is used for making soap, margarine and cooking-oil. Millions of fresh nuts, as well as copra and coconut oil, are exported each year. Other useful products of the coconut are the coir, used for making brooms and matting, and toddy, which is a strong drink made from the young flowers of the palm.

Pineapples

West Malaysia has a climate suitable for the growing of pineapples, and the crop is able to bear fruit twice a year.



(Above left) A pineapple estate at Pekan Nanas. The pineapples here are grown on peaty soils. The picture on the right shows pineapples at close range.

Pineapples are grown mainly for the pineapple-canning industry which cans the fruit for sale in Britain, Canada, the United States and countries in the Middle East.

The growing and canning of pineapples is mainly in the hands of the Chinese.

Inside a pineapple cannery. The picture shows fresh pineapples being peeled and cored.



Three-quarters of the total acreage of about 42,000 acres produce fruit for the canning industry, while the remainder produce fresh fruit for local consumption. About half the total acreage devoted to the cultivation of pineapples for the canning industry is in the form of estates, while the other half is in smallholdings.

Pineapples are grown mainly on the peaty soils of western Johore and also in Selangor. They are grown for sale as fresh fruit in Perak, Trengganu and Kelantan. The deep peaty soils are not suitable for crops other than pineapples and vegetables, which have shallow root systems. The provision of drainage has improved these peaty soils and made them suitable for pineapple cultivation.

West Malaysia was at one time the second most important producer of pineapples in the world, next to Hawaii, but keen competition from Australian and South African pineapples has reduced the export of canned pineapples. The foreign

competitors have been more advanced in their methods of advertisement and more vigorous in their salesmanship.

However, local uses of pineapples have increased in extent, for instance, in the making of pineapple jam and syrup for soft drinks.

The canning of pineapples is carried on in Johore, Selangor, Penang and Perak.

Other Crops

Cocoa is a crop which may be of future importance in the country, as the climate is suitable for it and there are about 100,000 acres of land with suitable soils available for its cultivation. The suitable areas are mostly those with soils derived from the Pahang Volcanic Series of rocks. These areas are the low and gentle slopes of hills and river valleys in the eastern part of the country. At present several cocoa estates totalling over a thousand acres are located in Trengganu. The methods of growing this new crop and processing its product are not known to farmers in the country. But this difficulty can be more easily solved than a serious tree disease which has yet to be overcome. When this disease is brought under control, cocoa promises to become one of the more important cash crops in West Malaysia.

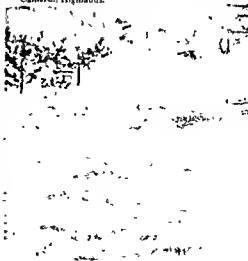
Tea is grown on the Cameron Highlands and in lowland areas in Selangor, Perak and Negri Sembilan. Two-thirds of the total acreage is on the highlands. The lowland yields of tea are higher than yields on the uplands, but the upland tea is of better quality. The total production of tea is between five to six million pounds per year, most of which is exported. Strange to say, a slightly greater amount of tea, mostly of lower grades, is imported for local consumption.

Tapioca is the most important of the other minor crops, as it occupies a large total acreage. Tapioca is used as a cheap substitute for rice, and as it is rich in starch there is a small tapioca-flour industry producing commercial starch.

Coffee is grown mainly in Selangor, where over 75% of the country's crop is planted along the coastal areas. It is cultivated in smallholdings, unlike the position in Brazil and other major coffee-producing countries where large estates are more usual. The chief variety planted in the country is *Liberica* coffee, which does not enter the international market but is consumed locally. The total acreage for coffee is slowly increasing. Formerly, it was less than the total acreage of land under tea, but now it has exceeded the tea acreage.

Vegetable and mixed farming. The Chinese market gardeners are the most intensive farmers in West Malaysia. They

Women picking tea leaves in an estate in the Cameron Highlands.



either concentrate on growing vegetables on the outskirts of towns for sale to the townsfolk, or combine vegetable gardening with the rearing of pigs, poultry and freshwater fish. For vegetable gardening they prefer sites near streams, so that water for irrigating the crops is easily available. They grow vegetables successfully on a variety of soils, with heavy and regular applications of manure in the form of

pig dung, cow dung, prawn dust and liquid application of groundnut cake or soya bean cake, and sometimes human excreta (night soil and urine).

Other minor crops are small cash crops of spices (arecanuts and pepper), maize, tobacco, sugar-cane and groundnuts. Fruits such as bananas, durians and rambutans are minor crops although they are widely grown.

EXERCISES

1. (i) Discuss the role of rubber in the development of West Malaysia.
(ii) What are the major problems faced by the rubber industry in West Malaysia?
2. Describe the annual distribution of rainfall in Malaya (West Malaysia) and show how it affects the production of rubber, rice and tin.
3. Draw a sketch-map showing the chief rice-growing regions of Malaya (West Malaysia). Explain why rice growing is important in these areas.
4. Account for the predominance of rubber in the west coast of West Malaysia. Illustrate your answer with a sketch-map.
5. What are the major problems encountered in the cultivation of padi in West Malaysia? What has been done to overcome these problems?
6. Locate the chief oil-palm and coconut-growing areas in West Malaysia and explain the geographical factors that have influenced the cultivation of these two crops in the areas you have located.
7. What are the areas in West Malaysia which are important for vegetable and mixed farming? What are the conditions which influence their location?

West Malaysia: Fishing and Timber Production

Fishing

Fishing is an important occupation of the coastal Malays and Chinese. To the Malays, fish is the main source of animal protein; it is also an important item in the diet of the Chinese and Indians. The total production of fish each year is nearly equal in value to that of rice. The production has increased in recent years, and this increase has been partly due to the fact that more and more fishermen are mechanising their boats, so that they can venture into deeper waters away from the inshore fishing areas.

Of the total number of 61,500 people engaged in fishing, about 70% are Malays and nearly 30% are Chinese. Although the fish production of the eastern states of Trengganu, Kelantan and Pahang is only about one-fifth of the total production in the country, the number of fishermen in these states is nearly half the total number found throughout West Malaysia. The smaller total catch in the eastern states, in spite of the greater number of people engaged in fishing, is largely due to the rough seas and violent weather during the North-East Monsoon months, especially from December to February. During these months, fishing activities along the east coast come to a standstill.

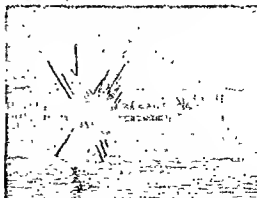
Most of the fishing is still of the inshore type, confined to the shallow inshore waters of the Strait of Malacca and to a belt of about 10-20 miles in extent, bordering the east coast. Although about 65% of

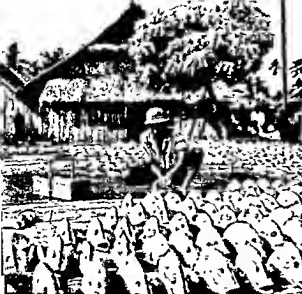
the fishing boats are powered by engines, most of the fishermen do not venture very far beyond the shallow waters bordering the shore. This is especially so with the Malay fishermen who do not usually make fishing trips lasting more than a day.

Perak is the leading fish-producing state, with a total annual output of more than three times that of Selangor, the second most important state. Furthermore, Perak has the largest number of mechanised fishing boats. The other states in order of total fish production are: Trengganu, Kedah, Johore, Penang, Pahang, Perlis, Kelantan and Malacca. Negri Sembilan has only a very small production.

Among the many different methods of catching fish, the most important is that of using traps set in the shallow waters off the coast. The commonest type of fishing traps is the *kelong*, which is built of nipah

The *kelong* is the most common type of fishing trap used in the fishing of West Malaysia's shallow waters. *Kelongs* like this are mainly operated by the Chinese fishermen.





Not all the fish caught are sold fresh. Part of the catch is salted and dried before it is sold. This is especially so amongst the east coast fishermen who are removed from the major markets situated in the west coast.

palm poles or bamboo stakes standing in water less than 20 feet deep. The thousands of *kelongs* account for about 35% of the total annual catch of 198,500 tons of fish. Most of the *kelongs* are operated by Chinese fishermen, and are located mainly off the west coast. Other methods of catching fish involve the use of lines and hooks, seine nets, drift nets, lift nets and drive-in nets.

The lines and nets used nowadays are increasingly made of synthetic material, such as nylon.

Along the east coast, especially in Trengganu, there are many villages almost entirely devoted to fishing. Along the west coast the villages around Pulau Pangkor in Perak also specialise in fishing.

The west coast landing points are near the main towns, to which transport facilities are ample, so that the iced fish arrive at the town markets in a fresh condition. But

on the east coast there are very few large towns and transport facilities are poor. The greater part of the catch is therefore dried or salted. But the Government has brought about improvement in the cold storage facilities in the east coast areas with the result that the fishermen are increasingly refrigerating most of their fish and salting less of the better types of fish for sale to distant markets.

Freshwater fishing adds to the total production of fish by more than 20,000 tons a year. The fish are obtained from the wet-padi fields, rivers, lakes, swamps, disused mining pools and also the fish ponds constructed by Chinese farmers. The fish reared in the fish ponds include the common carp, the mud carp, the silver carp, the grass carp and the big-headed carp. Most of the carp are reared from fry (baby fish) imported from China. The carp-rearing industry has been expanding in recent years, and Malays have also taken it up. Most of the carp ponds are found in the western states and in central Pahang.

The canning of tuna, a very large fish caught in deep-sea fishing, is a new industry started by a Malaysian-Japanese company, which has a canning factory in Penang. The canned tuna is exported to countries in Western Europe.

The rearing of cockles (*batu harm*) has also been developed in large areas of mud-flats in Perak and Penang, and in other mangrove-swamp areas on the west coast. The natural cockle beds off the Selangor coast, near Beting Gopal, have been re-established after being rendered non-productive by other forms of fishing.

The Fisheries Department of the Government and the fisheries schools at Penang and Kuala Trengganu are helping fishermen

to improve their methods of fishing. At the same time encouragement is given to the fishermen towards greater mechanization as well as to engage in deep-sea fishing and to venture to new fishing grounds.

The Timber Industry

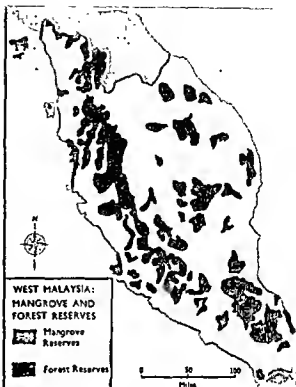
The production of timber is an important export industry. The export of timber is in two main forms: round logs and sawn timber. The export earnings from round logs have risen, owing to an increase in production and higher prices. The production and export of sawn timber have also risen. The total production of timber in West Malaysia is about one million tons.

As was stated in an earlier chapter, about 70% of the land surface of West Malaysia is covered with forests. Apart from the mountain forests above 4,000 feet and the sub-montane forests between 2,000 and 4,000 feet, there are three main types of forests. They are:—

- (i) the lowland rainforests, found up to a height of about 2,000 feet;
- (ii) the freshwater swamp forests, covering about 2,000 square miles;
- (iii) the mangrove swamp forests, covering about 550 square miles of tidal land, found mainly on the west coast.

Of these three main types of forest which produce timber, the lowland forests and the freshwater swamp forests are the chief sources of timber supplies. As attempts are being made to convert large areas of the swamp forests into agricultural land for the growing of food crops, future supplies of timber from such forests will be gradually reduced. The mangrove swamp forests yield poles, which are used in tin-mines and for kelong construction, and as charcoal and firewood.

The forests of Johore yield the most



hardwood timber, followed by Perak, Pahang and Negri Sembilan. The swamp forests of Perak yield the most poles and charcoal, while the forests of Selangor, Perak and Trengganu yield the most firewood. The production of poles and firewood is decreasing in importance, but the demand for and production of charcoal have been maintained.

The extraction of timber in West Malaysia is a difficult business and occupation. The yields of West Malaysian timber are very much lower than those in the coniferous forests of the North European countries such as Sweden, Norway and Finland. Trees of a single species are not found growing together in stands, but are found scattered over a wide area. Often only one tree of commercial value is found in several acres of forest. This is true especially of the heavy hardwoods. Most of the trees



Sawmilling is an expanding industry which faces increasing transportation costs as the sources of logs become farther removed from the sawmills.

growing abundantly close together have very soft timber which is not in demand. Besides, the trees which are most wanted may be in a highly inaccessible part, and the high transport costs involved in this case would not justify their exploitation. Floating logs down rivers is another problem, even if the useful trees are found not too

far from the rivers. The problem arises from the fact that the logs of many heavy hardwoods do not float well. Lighter timber and poles are, however, floated down streams, especially in the eastern lumbering areas.

Timber extraction is managed mostly by Chinese timber merchants and owners of sawmills, but the industry is under the control of the Government, as certain Forest Reserves are not available for logging. There are several hundred sawmills in the country. Sawmilling is an expanding industry, but the sources of logs are getting farther and farther away from the sawmills. Besides, the increasing export of round logs is causing a shortage of timber for the sawmills.

A certain amount of light hardwood timber is used in the making of cardboard and plywood. Other forest products of economic value form only about 5% of the total value of forest products. These minor products include nipah, rattan, jelutong, resins, damar, tanning-bark and medicinal products.

EXERCISES

1. "Although the number of fishermen in the east coast states of West Malaysia is nearly half the total number found in the whole country, they land only about one-fifth of the total production of the country". Explain.
2. What are the major problems faced by the fishermen of West Malaysia's east coast?
3. Write an essay on the timber industry of West Malaysia.
4. Account for the lower-yield of timber from the West Malaysian forests, despite their luxuriance, as compared to the yield from the temperate forests.

West Malaysia: Minerals and Mining

Tin

In the world, there are 37 countries in which tin is mined. Of these countries, six produce about 90% of the total world output. Of these six, Malaysia is the chief producer. Malaysia, Indonesia and Thailand are among the six leading tin-producing countries. These three countries are all in South-East Asia where there is a long tin-belt stretching for 2,000 miles from Yunnan, in the south-west of China and North Vietnam, through Laos, peninsular Thailand and Burma, West Malaysia and continuing southwards to the islands of Singkep, Bangka and Belitung, off the south-eastern coast of Sumatra.

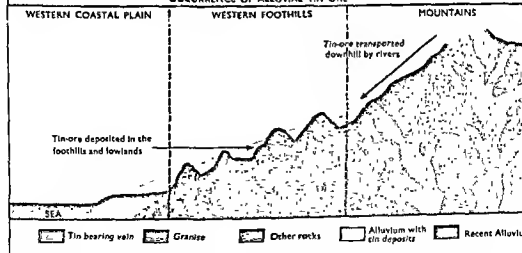
Tin does not occur in the form of pieces of metal, but as an ore from which the metal can be obtained by smelting. The commonest kind of tin-bearing minerals is cassiterite, an oxide of tin. Cassiterite, or tin-ore, is in the form of tiny grains which

may be black; grey, reddish, yellow, brown or colourless.

In West Malaysia the *primary* or original deposits of tin-ore are veins or lodes usually occurring in the margins of the granite masses. These margins are the zones of contact between the granite and sedimentary rocks. Tin in the primary deposits is known as lode tin. Most of the tin-ore mined in Malaysia, however, comes from *secondary* deposits. Throughout the past millions of years, much of the primary tin-ore was gradually worn down and washed away by the rain. It was carried by the rivers and streams and deposited on alluvial flats in the valleys of rivers, on the coastal plains and also on the sea-bed near the coast or near river mouths. These secondary deposits are also known as alluvial deposits, and the tin-ore in these deposits is known as alluvial tin-ore.

The tin areas in West Malaysia occur

OCCURRENCE OF ALLUVIAL TIN-ORE



WEST MALAYSIA: MINERALS

① Tin

① Iron-ore

T Tungsten

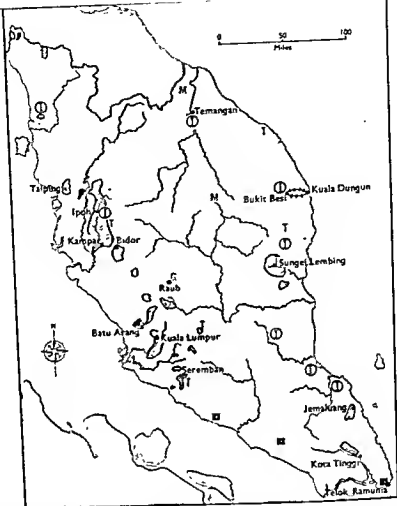
■ Bauxite

▲ Coal

M Manganese

G Gold

— Railway



in two belts, the major western tin-belt and the less important eastern tin-belt. The western tin-belt lies on the western side of the Main Range and on either side of the smaller ranges which lie to the west of the Main Range. Within this belt is the Kinta Valley which lies between the Kledang Range and the Main Range. It used to be the most important tin-mining area. South of the Kinta Valley in Perak, Selangor, Negri Sembilan and south-western Pahang are other important tin-fields. Nowadays

most of the tin produced in the country is obtained from the alluvial deposits located to the north and south of Kuala Lumpur in Selangor.

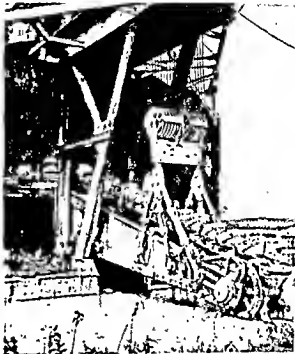
The eastern tin-belt has fewer and poorer tin-fields. These are the deposits found in Kelantan, Trengganu, Pahang and Johore. Pahang has the richest field, containing primary deposits of lode tin, which is worked at Sungai Lembing. In Johore the tin-fields are located near Jemaluang and north of Kota Tinggi.

METHODS OF MINING TIN

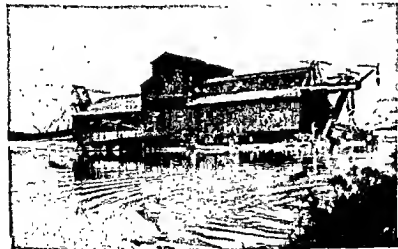
There are two main methods of mining tin: dredging and gravel-pumping. Other less important methods include underground or shaft mining, hydraulic mining, open-cast mining and dulang washing.

DREDGING This is the most efficient method of tin mining for it can extract practically all the cassiterite in the ground. Furthermore, it can work low-grade ground at a lower cost than other types of mining. Besides these, dredging has the distinct advantage of being able to exploit deposits which occur in swampy or wet ground. On the other hand, a dredge costs seven or eight million dollars. Such a huge capital expenditure can only be justified by the distinct advantages of dredging. Although there are far fewer dredges than gravel-pump mines in the country, they account for more than half the total tin production of West Malaysia.

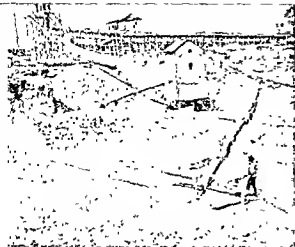
A dredge is a huge structure floating on a paddock or man-made pond covering several acres. It carries an endless chain



ABOVE: The dredge's endless chain of buckets dig up and carry the tin-bearing alluvium high up into the dredge. Each bucket weighs about 2 tons

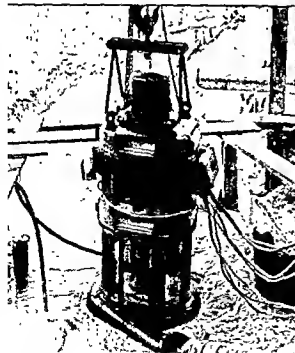


LEFT: A tin dredge floating on a paddock which is being continuously enlarged by the chain of buckets. The tailings are deposited at the back of the dredge (far left)



Monitors at work in a gravel-pump mine. The jets of water break up the tin-bearing material which is then washed down into the sump

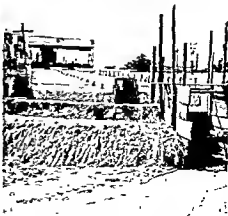
of large steel buckets which can dig down to 100 feet or more and bring up the alluvium. The movement of the chain is powered by electricity or steam. On board the dredge is a treatment plant which separates the cassiterite from the alluvium. The unwanted material, called tailing, is passed out through



chutes from the rear or 'tail' of the dredge and spread behind the dredge to fill parts of the paddock.

GRAVEL-PUMPING is a more common method of mining tin. A gravel-pump mine costs between \$100,000 and \$150,000, which is much less than the cost of a tin-dredge. While the dredges are owned by European companies, most of the gravel-pump mines belong to Chinese miners. Gravel-pumping is the only suitable method for smaller areas, especially where the bedrock is hard and uneven. A gravel-pump mine is like a small lake with all the water pumped out of it. It begins with a hollow dug in the ground, which gradually grows larger and deeper as the alluvial rock is removed. The tin-bearing alluvial rock is broken down by a powerful jet of water from a gun-like nozzle called a *monitor*. The broken-down material is carried along a water channel to a collecting hollow called a *sump*. A gravel-pump in the sump sends the tin-bearing material up to the top of a palong sluice. This is a large and sloping structure or framework built of timber and poles. The gravel (tiny stones), sand and earth, with which the cassiterite is mixed, are carried by a stream of water down the sloping

In the sump, an electrically-operated gravel pump (left) sends the tin-bearing material up to the palong where the heavier tin-ore is trapped behind the wooden bars placed across the palong



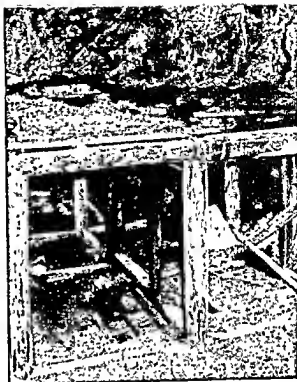
palong. As the cassiterite is heavier than the waste material, it gets trapped behind wooden bars placed at regular intervals across the palong.

The tin-concentrate is taken to a treatment shed where it is re-washed to get rid of all waste material. It is then dried and put into sacks ready to be sent to the smelting works in Penang, Butterworth or Klang.

HYDRAULIC MINING This is almost similar to gravel-pump mining. A hydraulic mine is only possible near a source of water-power. A dam built across a stream high above the mine supplies a fast flow of water which works the monitor jets. The broken-down material containing tin is carried through a high-pressure water pipe to the top of a palong, instead of being lifted by a gravel-pump. The latter operations for separating the tin-ore from the gravel and earth are the same as in a gravel-pump mine.

OPELCAST MINING These are dry surface mines where the tin-bearing deposits are removed from the ground by means of mechanical shovels and excavators instead of powerful jets of water. The material is collected in a dry state and taken by conveyor belts to a treatment plant where it is mixed with water and shaken to separate the ore from the waste material which is washed away.

UNDERGROUND TIN-MINING or shaft-mining is carried on in two areas. One is the Kaki Bukit area in Perlis, where there is small-scale mining through shafts sunk into the ground and in limestone caves. Only small pockets of tin-ore are mined here. A very important underground tin-mine, the largest of its kind in the world, is located at Sungei Lembing in Pahang. In the huge mine there is a central shaft sunk 1,200 feet into the earth from which more than 200 miles of tunnels lead in different



A striking picture on the underground mining of lode tin. The lode-tin veins can be seen above the supporting sunders in this shaft. The lode veins are lighter in colour. On the floor is a steel grid which prevents big pieces of rock from falling into the carry-away chute below.

directions to the lode-tin deposits. The lode-tin deposits are blasted out with explosives or drilled out by compressed air. The tin-bearing rocks are put into trucks which carry them to the lift located in the central shaft of the mine. When they have reached the surface of the mine, they are taken to the treatment plant, where the rocks are crushed and then treated in the same way as alluvial tin-bearing material. This lode-tin mine has been in operation for more than 80 years.

DULANG WASHING The dulang method, or panning by hand, is carried out by individual women workers who use a saucer-shaped pan, about 20 inches in diameter, made



Dulang washers at work. They stand for long hours in the water, scooping up the earth with wooden pans to collect tin-ore from the river bed.

of jelutong wood. The dulang washer scoops up some tin-bearing sand and water and swirls the dulang round and round so that the lighter sand is washed over the edge and the heavier tin particles stay at the bottom. This method is used by dulang washers in old opencast mines and along the beds of shallow streams. Each year, a total of several tons of tin is obtained in this way in West Malaysia.

SMELTING

The tin-ore has to be smelted in order to obtain pure tin. The smelting works are located in Penang, Butterworth and Klang. In these smelting works, the ore is first mixed with limestone and anthracite and then heated at very high temperatures in furnaces. The metal obtained by this process is not suitable for commercial use and has to be further refined to 99.9% purity. The refined

tin is then made into 100-lb. ingots.

IMPORTANCE OF THE TIN INDUSTRY

Tin mining is the chief mining industry in West Malaysia. The country produces nearly one-third of the total world production of tin and is the world's leading producer of this metal. As an export commodity tin is second to rubber. About 72,000 long tons of tin are produced in a year, fetching about \$680 million.

Although tin prices are lower than in previous years, they are sufficiently high to keep many marginal mines in production and to lead to the opening of new mines. There are over 1,000 tin mines in operation.

OTHER MINERALS

Among other minerals produced in the country, iron-ore and bauxite are the most important. *Iron-ore* has been mined in several areas, especially at Bukit Besi in Trengganu. The annual production from this and other mines amounted to more than 6½ million tons in recent years, but this production has declined to about 5.8 million tons. The reserves of good-quality iron-ore are not very large and are being gradually exhausted. Besides the Bukit Besi area, there are deposits being worked at Rompin in Pahang, the Ipoh-Tambun area in Perak, Temangan in Kelantan, Sri Medan in north-western Johore and Semling and Tupah in Kedah. Most of the iron-ore is exported to Japan.

Bauxite is a mineral from which aluminum is obtained. It occurs in many parts of the peninsula, especially in the south. There are at present only two active bauxite mines, both located at Telok Ramunia in south-eastern Johore. They produce over 300,000 tons a year, and the ore is mostly exported to Japan.



Coal is the only solid mineral fuel of any economic importance in West Malaysia. It is found at Bukit Arang in Perlis, Enggor in Perak, Batu Arang in Selangor and also in Johore. But only the coal in Batu Arang was worked to any great extent. In the Batu Arang field, coal was extracted by the opencast and the underground methods. The mine was started in 1915 and operations ceased in 1960. This was due to the Malayan Railway and the Central Electricity Board switching over from coal to oil. They had previously been the major consumers of coal.

Small scattered deposits of *gold* are found along the east coast of West Malaysia.

Both alluvial and lode deposits can be found. Of the mines working the lode deposits of gold, the Raub mine in Pahang was the only important one. It has now ceased operations. Alluvial gold ore is obtained from the Kelantan, the Trengganu and the Pahang rivers by the dulang washers.

Manganese is found in small quantities in Kelantan and Trengganu. The total output of manganese ore in 1961 was 6,400 tons.

The extraction of *tungsten* in West Malaysia is associated with the mining of tin and gold. Wolframite and scheelite are the important tungsten ores extracted

EXERCISES

1. Describe the different methods of tin-mining used in Malaya (West Malaysia). Show the importance of tin mining to the people of Malaya (West Malaysia).
2. Write briefly on the mineral resources of West Malaysia.
3. Draw a sketch-map to show the "tin and rubber belt" in Malaya (West Malaysia) and insert the main areas of tin and rubber production. Explain carefully why this belt is limited in area.
4. Distinguish between primary deposits and secondary deposits.
5. Describe the dredging and gravel-pump methods of mining. Under what circumstances is dredging a better method of mining tin than the gravel pump?

Chapter 7

West Malaysia: Population and Towns

In West Malaysia the population consists mainly of Malays and Chinese, with Indians and Pakistanis forming an important minority group. The Malays form about 50% of the population, the Chinese nearly 37% and the Indians, Pakistanis, Arabs and others total about 13%. There are also about 50,000 Orang Asli living mainly in the interior of the country. The Malays lead a predominantly rural life, while most of the Chinese, Indians, Pakistanis, Arabs and others prefer town life. The Chinese and Europeans are largely engaged in the tin and rubber industries and in commerce, while a large number of Indians work in the rubber estates. The civil service and the professions include people of all races.

The following figures give the total population in West Malaysia with the breakdown sub-totals according to the main racial groups:

Malays	4.29 million
Chinese	3.14 million
Indians & Pakistanis	.95 million
Others	.24 million
Total Population	8.62 million

Population Densities

The average density of population in West Malaysia is about 170 persons to the square mile. This is rather misleading for the population is distributed very

unevenly, with some parts of the country very densely populated, while many others are scarcely populated. A generalised pattern of population distribution consists of two zones of high population densities and two zones of very low densities.

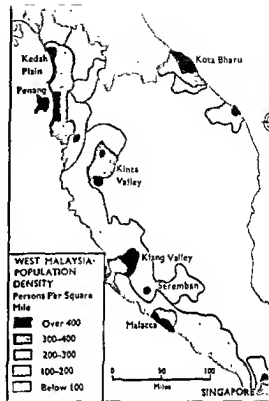
The two zones of high densities are: (i) a long western belt which stretches from Perlis in the north to the south-west of Johore in the south, and includes the West Coast Plain and the western foothills of the mountain ranges; and (ii) a smaller zone in the north-east of the country, occupying the coastal and inland areas around the deltas of the Kelantan and the Trengganu rivers. *

The two zones of very sparse population are: (i) the interior forested highlands in the northern half of the country, including the Main Range and other mountain ranges and the huge highland complex called the Trengganu Highlands; and (ii) the eastern half of the country south of the Pahang river. In these two zones the average density is as low as 0-25 persons to the square mile. Other areas of very low densities are the swampy areas which have not been cleared for cultivation.

The remaining areas have moderate densities of population. They include (i) the areas adjoining the densely populated zones, (ii) the interior river valleys, especially along the Pahang river, the Perak river and the Kelantan river, and (iii) the narrow east coast strip bordering the South China Sea.

Certain very densely populated parts may be singled out from the general zones of high population densities. They are, in order of density and size, the following:

1. The Klang Valley, including the districts of Kuala Lumpur and Klang. This is not only an important agricultural and mining area, but also has commercial and urban functions, including administrative ones, as Kuala Lumpur is the capital of Malaysia.
2. The State of Penang, including Province Wellesley. Penang is the second largest town in the Federation of Malaysia and also its chief port. Its commercial and other urban functions, together with the agricultural activities in Province Wellesley, are the bases of the large population in the area.
3. West-central Kedah, stretching along the coast from Alor Star to Province Wellesley and including the districts of Alor Star, Kuala Muda and Yen. This area has a population based on the main agricultural activity of padi growing, with a considerable number of the people engaged also in fishing and rubber cultivation. The area is, by far, the most important padi-growing area in the country, and of all the grain crops padi is the one with the largest capacity for supporting a dense population.
4. Another area of high population density is the Kinta Valley, in which there are intensive tin and iron-ore mining activities, together with the cultivation of rubber. The area includes the third largest town in the country, Ipoh, and several other mining towns.
5. The fifth densely populated area in the western region is the State of Malacca, which has had a long history



of settlement, trade and agriculture since the days of the Malacca Sultanate in the 15th century. The commercial activities have declined in importance, but the cultivation of rubber, padi and coconuts has continued to maintain human settlement at a high level of density.

6. The north-east part of the country, including the lower valley and deltaic area of the Kelantan river, is the main area of high population density in the eastern region. The large population, which is almost entirely rural, is accounted for by the presence of large areas of good agricultural land suitable for the cultivation of padi, similar to the situation in the north-western section of the country. This high population

density has not been due to large-scale immigration as is the case in the west coast, but is due largely to natural increase and, to a lesser extent, small-scale immigration.

From a settlement and economic point of view, the western belt is the most important region of West Malaysia. Although it occupies less than one-third of the total area of the country, it has, on the other hand, about three-quarters of the total population. This has been due largely to the following reasons:

In the first place, the relatively sheltered west coast, with its good harbours, attracted sea-going ships which brought trade and settlers to the region.

Secondly, the relatively extensive west coast plain, with large areas of fertile alluvial soils, especially in the deltas and lower river valleys, attracted the early Malay farmers and later, settlers from neighbouring countries.

Thirdly, the presence of rich tin-ore deposits along the western foothills and river valleys brought large numbers of Chinese miners and mine-workers to the western region. This large-scale immigration and the development of the tin-mining industry resulted in the growth of mining settlements, the beginning of rail transport and the general economic development of the region.

The introduction of rubber to the country served to further concentrate the population along this western belt. The location of the rubber plantations was not so much influenced by environmental conditions but rather by the existence of transport facilities and the nearness of good ports. The railways, originally intended to serve the tin-mining areas, provided transport for the rice, materials and workers

needed by the estates, and for the transport of rubber to the ports for export. The introduction of rubber also saw the large-scale immigration of southern Indians to the country to work as labourers in the estates. All this led to the growth of towns and further development of the transportation system, which was accompanied by a great increase in population. The towns in the western belt, forming the large majority of towns in the country, themselves attracted more and more people with their urban facilities and thus proved a major factor in the process of population increase.

The east coast region, on the other hand, has generally remained thinly populated owing to (i) the more exposed east coast, (ii) the lack of good harbours, (iii) the smaller areas with fertile alluvial soils except in the north-east, (iv) its poorer resources in tin, the deposits being scattered and less easily worked than those in the western region, (v) the lack of good communications, and (vi) the isolation of the region from the better developed western region owing to the mountain barriers lying between the two regions. The eastern region, therefore, proved unattractive to sea-borne traders and immigrant settlers and has remained relatively backward and thinly populated.

Main Ports and Towns

Kuala Lumpur

Kuala Lumpur, with a population of nearly half a million, is the largest city and the capital of Malaysia. It is sited at the confluence of the Klang river and its tributary, the Gombak. It thus commands both the upper valley of the Klang and the valley of the Gombak. It is situated on the lower foothills to the west of the Main Range and commands the route through one of the few gaps across

the Main Range. This gap route is now part of the only east-west trunk road across the Main Range. The road runs from Port Swettenham, on the west coast, via Kuala Lumpur, Bentong, Temerloh and Maran to Kuantan on the east coast.

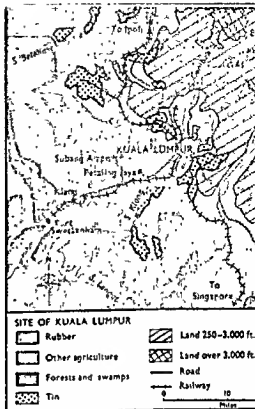
Like Ipoh, Kuala Lumpur began as a small mining settlement. During the wars in Selangor before the British intervention, Kuala Lumpur proved to be well sited for defence. After the wars, it grew into an important tin-collecting and trading centre during the tin-rush to develop the rich tin-ore deposits around the settlement. It controlled the inward movement and distribution of food and other essential goods for the mining community around it. The British chose it as their administrative centre in Selangor.

When the four Malay States of Perak, Selangor, Negri Sembilan and Pahang were brought together to form a federation in 1896, Kuala Lumpur was chosen to be the capital of the Federated Malay States, owing to its being the administrative headquarters of Selangor, which was the most centrally situated state in relation to the four Federated Malay States and the adjoining Settlement of British Malacca.

When the full Federation of Malaya was formed after World War II, Kuala Lumpur was selected as the Federal capital owing to its relatively central position in the western belt of advanced economic development and high population density.

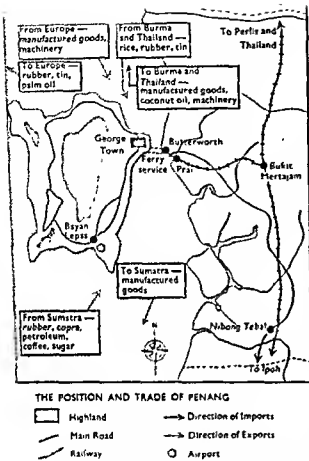
Besides being the centre of an important tin-mining area, Kuala Lumpur also became the focus of a rich agricultural area with the development of the rubber industry. Rubber was first established in its neighbourhood, where the coffee estates were converted to rubber plantations.

Kuala Lumpur is also well situated to



be the focus of road, rail and air routes. Several important roads converge on it, including the north-south trunk road and the east-west trunk road. It is on the main railway line and has rail connection with the second main port in the country, Port Swettenham, only 27 miles away. It is not only on the international air-routes, but is also the centre of internal air-services to all the other six towns which have major internal airports. They are Penang, Ipoh, Alor Star, Malacca, Kota Bharu and Kuantan.

Kuala Lumpur has added secondary industries to its other functions, as it has ready access to imported raw materials by way of Port Swettenham and the new port to the north of the older port. As the Federal capital of Malaysia, and as



the commercial, transportation, industrial and cultural centre of the greater part of the Tin and Rubber Belt as well as of the rich Klang Valley itself, Kuala Lumpur is indeed the most important city in Malaysia.

Penang (George Town)

Penang is the chief port and the second largest city in Malaysia. The island of Penang is situated off the north-west coast of West Malaysia and lies at the northern end of the Strait of Malacca. The strait separating the island of Penang from the mainland is between two and ten miles in width. The city and main port area, called the City of George Town, is sited

at the north-eastern corner where the island is nearest the mainland. Penang harbour is a natural harbour sheltered by the island itself. A deep-water wharf at Swettenham Pier at the eastern end of George Town provides two berths for ocean-going ships, but most large ships lie at anchor in the Roads or main anchorage between the island and the mainland. A fleet of nearly 100 lighters (tongkangs) transfer the cargoes to and from the ships out in the harbour. New wharves providing six berths are being built at Butterworth on the mainland for large ocean-going ships. The Butterworth port complex will add to the facilities of the Port of Penang.

Since its foundation, Penang has been an entrepot port, importing and re-exporting the products of southern Thailand and northern Sumatra and, to a lesser extent, of Burma. It imports from southern Thailand (Peninsular Thailand) rice and other produce, and exports to Thailand petroleum products and manufactured goods, especially machinery and other iron and steel goods. Tin from Thailand is not imported in large quantities any more. Penang used to import from northern Sumatra, rubber, copra, petroleum, coffee and sugar and to export to Sumatra manufactured goods imported from foreign countries. This trade ceased with the outbreak of Indonesian Confrontation. Although Confrontation has ended, the volume of this trade has not reached the level of the pre-Confrontation period. Burma exports to Penang rice, rubber and tin, and imports in return coconuts, coconut-oil and betel-nuts (from the pinang tree).

Nowadays, however, the entrepot trade of Penang forms only 15-20% of its total trade, as its wider hinterland has shrunk and because of strong competition from

Singapore. Its main trading activities are the importing of goods for West Malaysia and the exporting of the main produce of the country. In these functions it serves mainly its own hinterland which comprises the north-western states of Perlis, Kedah, Province Wellesley (part of the State of Penang) and northern and central Perak, including the Kinta Valley mining area. Its exports of rubber have now been exceeded by those of Port Swettenham.

The main exports of Penang are rubber, tin and betel-nuts. The port no longer enjoys full Free Port status, but only restricted Free Port status, with a 2% surtax levied on all imports except rubber, tin and tuna fish. It has many small-scale industries, among which are rubber-milling, tin-smelting, the extraction of coconut-oil, the repair and building of boats and the canning of tuna fish. The island is also an important holiday and tourist centre.

Port Swettenham

Port Swettenham is the second main port of West Malaysia. It is situated at the mouth of the Klang river, about 27 miles from the capital, Kuala Lumpur. Owing to its central position on the west coast, it is more favourably situated to serve the Tin and Rubber Belt than Penang, which is near the northern end of the west coast.

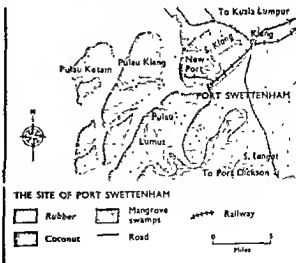
Port Swettenham is, however, poorly sited, being located on a coastal swamp, and its harbour is too shallow for large ships during low tide. The entrance to the harbour is also difficult for large ocean-going ships to pass through. As a result, the total tonnage of ships handled at the port is smaller than that handled at the Port of Penang, and the traffic has consisted largely of the coastal trade carried on with the minor ports on the west coast.

The international shipping trade has, however, increased greatly recently, partly owing to the building of new wharves at a new port area, north of the older port. The new port is located on the eastern side of the North Klang Strait and among its facilities are four berths for ocean-going ships. The new port area is served by both road and rail. The new site is nearer to the open sea and has deeper water and more commodious anchorage for large ships. Both the old and new port sites are sheltered by several off-shore islands.

Since the separation of Singapore from Malaysia, Port Swettenham has taken over much of the sea-borne trade formerly channelled through the port of Singapore. But although new wharves and additional port facilities have been provided, the total range of facilities is insufficient to cope with the increasing volume of external trade, much of which has still to pass through Singapore. Recently, the export trade in rubber has exceeded that of Penang and Singapore.

Ipoh

Ipoh, the third largest town in West Malaysia, is situated on the Kinta river,



which became not only its main source of immigrant settlers and workers, but also served as the main outlet for the products of Johore.

Situated at the southern end of the peninsula, Johore Bahru is the southern terminus of the railway system of the country and of the main roads in the State of Johore as well as of the trunk roads covering the length of the peninsula. This southern gateway commands the traffic of agricultural and other commodities produced in Johore and states farther north. It has therefore developed into a commercial centre serving especially the rich agricultural and mining areas in Johore which produce rubber, palm oil and palm kernels, pineapples, coconuts, tin and timber.

Malacca

The town of Malacca is an old historic town which was once the capital of an empire and later became the prize over which the Malay, Portuguese, Aehinese, Dutch and Bugis armies fought. It was formerly an important port, but with the increase in the size of ships and the silting of its harbour, its sea-borne trade dwindled, especially after the establishment of Penang and the rise of Singapore as a trading centre. Malacca has, however, remained as the capital of the State of Malacca and the main trading centre serving the padi- and rubber-producing areas of the state.

As a port, Malacca now serves mostly coastal steamers and smaller craft, with some larger ships calling at less frequent intervals. It exports the rubber produced in the inland areas and imports rice, sugar and other goods needed by the people in the state. The cargoes are loaded and unloaded by lighters, as there are no wharf-berthing facilities for large ships and

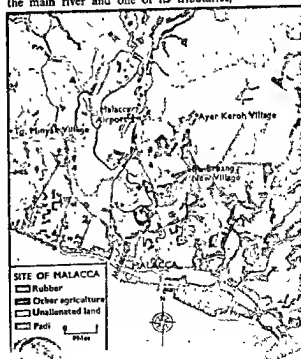
coastal steamers. The lighters transfer their loads to and from godowns along the banks of the Malacca river.

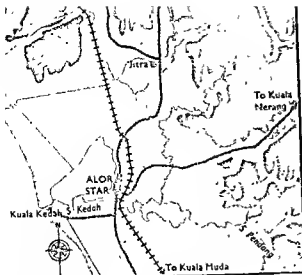
The silting of the anchorage for ships still continues, so that the sea anchorage has to be dredged at regular intervals to maintain the usefulness of the port.

Malacca lies on the trunk road running from north to south and has excellent road connections with the other important towns in the western region. It is also the focus of a good internal network of roads serving the State of Malacca. But it is not served by a branch line from the main railway, as the former branch line has not been replaced after being removed during the Japanese Occupation. The town, however, has an airport served by a regular internal air service.

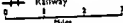
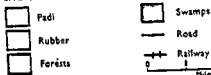
Alor Star

Alor Star, the capital of Kedah, is situated on the Kedah river at the confluence of the main river and one of its tributaries,





SITE OF ALOR STAR



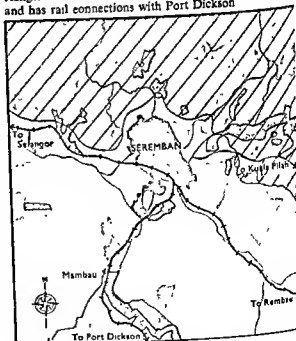
the river Pendang. It is sited a few miles from the river mouth and at the narrowest bridge-point on the river. It is thus in an excellent position to control the north-south traffic along the northern section of the West Coast Plain, as well as the east-west traffic along the Kedah Valley. Both the trunk road and the main railway line pass through Alor Star on their way to and from the Perlis-Thailand border. The town is also served by an airport.

Alor Star is the main trading centre of Kedah and it serves a rich and extensive padi- and rubber-growing region with a large rural population. Its main industry is rice-milling.

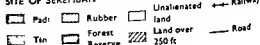
Seremban

Seremban is the capital of Negri Sembilan. Situated on the western foothills of the

southern part of the Main Range, it lies within the Tin and Rubber Belt and is the commercial centre of an area where rubber, tin and rice are produced. It commands two gap routes across the Main Range, as the southern part of this range to the east of Seremban is lower and less continuous than the northern part. One of the gap routes across the Main Range leads to Kuala Pilah, which is one of the towns and settlements in the state lying to the east of the Main Range. Thus Seremban, although situated well to the west of the state, is the real centre of the internal transport system in Negri Sembilan. As the focal point in the road system of the state, it unifies the western and eastern areas which are separated by the Main Range. It is also on the main railway line and has rail connections with Port Dickson



SITE OF SEREMBAN





WEST MALAYSIA: POPULATION AND TOWNS

river is badly silted and also partially blocked by shifting sand-bars, Kota Bharu has almost ceased to be a port. Another disadvantage is that the East Coast railway approaches the town on the side of the river opposite the town, and goods carried by rail have to be transported across the river by ferry. In spite of these handicaps, the town of Kota Bharu is important as the trading centre serving the largest agricultural and most densely populated area in the eastern region of the country. This area has the second largest acreage devoted to padi growing, after Kedah. Kota Bharu is well known for its craft industries, especially the making of beautiful silver and gold ware and the weaving of batik sarongs.

Kota Bharu is well served with roads, being the focus of a fairly dense network of roads covering the deltaic area of the Kelantan river. It is also near the northern end of the East Coast trunk road running from Tumpat in the north to Mersing in the south, and continuing south-westwards to Johore Bahru. There is also an airport at Kota Bharu from which air services to Kuala Lumpur are provided by the Malaysia-Singapore Airlines.

on the west coast. However, it does not have an airport.

Kota Bharu

Kota Bharu, the capital of Kelantan, is the largest town on the east coast. But its population of more than 40,000 is smaller than that of the major towns in the west coast states already described. It is situated on the Kelantan river, about seven miles from the coast. As the mouth of the

EXERCISES

1. Draw a sketch-map to illustrate the distribution of population in the States of Malaya (West Malaysia) and give reasons for the uneven distribution.
2. (i) Draw two sketch-maps each of Kuala Lumpur and Ipoh, the first to show its site and the second to show its general position in West Malaysia.
(ii) Describe and explain the rapid growth of the two towns.
3. For each of the ports, Penang, Port Swettenham and Malacca, draw a large-scale sketch map to show details of the site of the harbour and describe the main features of its trade.
4. Describe the chief occupations and the distribution of people in the eastern part of Malaya (West Malaysia).

Chapter 8

West Malaysia: Trade and Industry

External Trade

West Malaysia depends upon its primary industries for its export earnings with which to purchase the imports needed by the people of the country. The primary industries produce (i) agricultural commodities such as rubber, palm oil and palm kernels, copra and coconut oil and pineapples for canning, (ii) minerals such as tin, iron-ore and bauxite, and (iii) forest products such as round logs and sawn timber. As insufficient rice is grown to feed the population, and as secondary

Much of West Malaysia's rubber is now exported through Port Swettenham. Here in this photograph, crepe rubber is being loaded on to a ship beside the wharf.



(manufacturing) industries are not fully developed, large quantities of foodstuffs and manufactured goods as well as petroleum have to be imported.

In past years the total value of exports was much greater than the total value of imports, thus creating a favourable balance of external trade. But the serious drop in the prices of the main export items of rubber and tin has greatly reduced the export earnings, and the balance of trade is less favourable than in previous years.

Exports

The chief exports of West Malaysia in order of their export value are: rubber, tin, iron-ore, palm oil and palm kernels, and timber (logs and sawn timber). But for East and West Malaysia, as a whole, the order of importance in terms of export values is different, owing to the large exports of timber as well as exports of palm oil from Sabah. The following figures show the five major exports of Malaysia and their export values in 1967.

1. Rubber	\$1,290 million
2. Tin	\$ 760 million
3. Timber	\$ 593 million
4. Palm oil and kernels	\$ 134 million
5. Iron-ore	\$ 122 million

The chief rubber-importing countries are (i) Singapore (for re-export), (ii) the Soviet bloc countries, (iii) Western Euro-

pean countries (iv) the United Kingdom, (v) the United States, and (vi) Japan.

Tin is exported to (i) the United States, (ii) Japan, (iii) Western Europe, (iv) the United Kingdom, and (v) Canada.

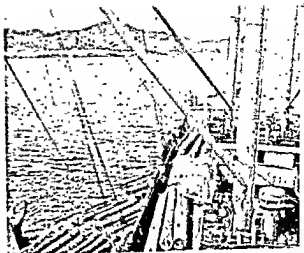
Palm oil and palm kernels are bought by (i) Singapore, (ii) the United Kingdom, (iii) Iraq, and (iv) the Netherlands.

The main trading partners of West Malaysia in terms of its export trade are (i) Singapore, (ii) Japan, (iii) the United States (iv) the United Kingdom, and (v) the U.S.S.R. Of these countries, the Republic of Singapore receives the largest percentage of the export commodities, most of which are re-exported to other countries. The United Kingdom buys rubber, tin, foodstuffs and vegetable oils such as palm oil and coconut oil. The main exports to the U.S.A. are rubber and tin. Japan is the biggest customer after Singapore. It buys almost all the iron-ore and bauxite and large quantities of rubber and tin. The U.S.S.R. is an important customer for West Malaysia's rubber.

Imports

The main category of imports consists of foodstuffs, including rice, beverages and tobacco. In value, foodstuffs account for more than 25% of the total import. Other important import commodities include machinery and transport equipment (motor vehicles), textiles and various other light manufactured goods, raw materials such as tin-ore, rubber and copra, petroleum and petroleum products, and chemicals.

Rice is imported from Thailand, the main source of supply, and Burma. Meat and dairy products come mainly from Australia and New Zealand. Neighbouring countries export raw materials and foodstuffs such as rubber, tin-ore, copra, pepper,



West Malaysia is an exporter of timber logs which are sometimes floated out to sea towards the ship, to be loaded for export.

palm oil and dried and salted fish. These are mostly re-exported, usually after being processed. Crude rubber is imported from Sumatra and Thailand, and copra from Sumatra and Sulawesi (Celebes).

As there is no petroleum produced in the country, this fuel is imported from the Persian Gulf countries of Kuwait and Iran as well as from Sarawak. The United Kingdom supplies much of the machinery, transport equipment and various manufactured goods. Textiles are imported mainly from Japan, Hong Kong, the United Kingdom, China and India. Japan is an important source not only of textiles, but also of printing paper, fishing nets, china ware, iron and steel goods and electronic goods such as radios and television sets.

Internal Trade

The internal trade of the country consists mainly of the sale of foodstuffs. Fish, rice, vegetables, fruits and coconut oil are produced in certain parts of the country and sold to other parts as well as locally. A certain amount of internal trade is carried on in livestock, for example, poultry, pigs



Textile manufacturing

and cattle. Forest products such as sawn timber, charcoal, poles and firewood also feature in the local markets. Finally, the locally made products of the light industries are playing an increasingly important part in the internal trade of the country. These range from fountain-pens and soap to tyres and refrigerators.

Industries

West Malaysia is essentially a primary producing country. In other words, the primary industries of the growing of crops, the mining of metal ores, the catching of fish and the extraction of timber from forests are of greater importance than secondary industries. The value of the total output from the primary industries is greater than that of the secondary industries. In recent years, the value of the exports of rubber alone has amounted to about \$1,300 million a year, while the value of the total output of all manufactured products amounted to only about \$650 million a year. In terms of employment too, the primary industries far exceed the secondary industries.

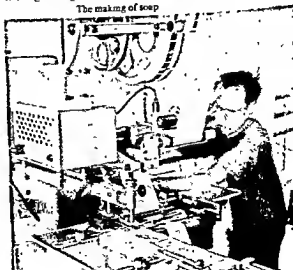
The main reason for the slow industrial development is the lack of raw materials for the heavy industries and other large-scale

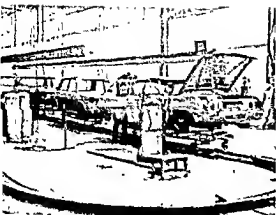
industries. While there are some reserves of good quality iron-ore, the reserves are not really large, and without good coal, especially coking coal, heavy industries such as the iron and steel industry and the building of large ships cannot be established on a large scale. Apart from tin, there is a lack of the base metals, such as copper, zinc and lead, and an absence of most of the ferro-alloy metals and other minerals such as mica, asbestos and sulphur.

Besides, the important industrial fibres such as cotton, wool, flax and silk are not produced in the country. Other adverse factors are the lack of technologists with their specialised knowledge, the shortage of skilled technicians and workers, the insufficiency of capital and the smallness of the internal market for the products of heavy and other large-scale industries.

The secondary industries that exist in the country may be broadly divided into three main groups: (i) processing industries; (ii) light manufacturing industries and (iii) light engineering industries. Of the three groups the light manufacturing and the light engineering industries have been

The making of soap





The assembling of motor-cars is an example of West Malaysia's industrial growth

steadily expanding. This is due to the activities of the pioneer companies, with factories located mostly in the recently established industrial estates. The pioneer industries manufacture well over 300 different products, of which the largest group consists of all sorts of chemical products.

Besides the large industrial estate in Petaling Jaya, there are other smaller industrial estates in the country — one at Butterworth, another at Batu Tiga near Petaling Jaya, where motor cars are assembled, three in Perak, located at Tasek (Ipoh), Tupai and Kumunting (Taiping), and two in Johore, located at Tampoi and Larkin.

Another important development in the sphere of heavy industries is the establishment of the first integrated steel mill at Prai. Here a joint Malaysian-Japanese venture called 'Malayawata' has set up the largest single industrial enterprise in Malaysia. This steel plant has a blast furnace for making steel. A second blast furnace is to be added. The steel from this plant will help to build up many steel-using industries. The plant uses iron-ore

produced in West Malaysia and charcoal from overaged rubber trees.

The processing industries carry out the processing of raw materials and agricultural products. They include rubber-mulling, tin-smelting, rice-milling, sawmilling, the processing of copra, tea and tapioca, and the extraction of palm oil and coconut oil. These industries take place both in estates and in places away from the estates, such as the main ports and towns. At present they employ the largest number of workers among the three groups of industries.

Light manufacturing takes place in more industrial units than the processing industries and employs a slightly smaller number of workers, but with its steady expansion it is likely to involve more workers in the future. These industries are being specially encouraged by the Government, especially with the awarding of pioneer status to new factories. They are engaged in the manufacture of several hundred different products. The most important are foodstuffs,

Boat building — a thriving light engineering industry





The making of silverware in Kelantan — an important cottage industry

including canned fruits, canned meat and fish, beverages, cereal foods (bread, *mee* and *mee-hoon*) and confectionery. Other products are soap, tyres, plastics, tobacco, textiles, rubber goods, furniture, cement, fertilisers, chemicals, paints, tiles and many others.

Light engineering forms the smallest of the three groups, employing about one-fifth of the number of workers engaged in each of the other two groups of industries. The industries include the repairing and servicing of equipment used in the processing industries, the building of boats, the making of simple iron and steel goods, machine parts, aluminium goods and metal containers, and the repairing of ships, railway equipment and motor-vehicles.

A fourth group of industries, namely, Malay cottage industries or handicrafts, is relatively unimportant. They include the making of mats, baskets, batik sarongs and beautiful silverware, especially in Kelantan and Trengganu.

EXERCISES

1. Write an essay on the agriculture and trade of West Malaysia.
2. What are the factors responsible for the slow industrial development in West Malaysia?
3. Write an essay on the industries of West Malaysia, paying special attention to the expansion of the light manufacturing industries.

Chapter 9

West Malaysia: Transport

The present transport pattern of West Malaysia has been influenced greatly by its physical structure. The mountain ranges running in a north-south direction have resulted in a similar alignment of roads and railways in the country. There are thus few trans-peninsular or east-west lines of transport.

A further important factor which accounts for the present-day transport pattern is the more developed nature of the west coast. It was the tin-mining industry which brought the country into an era of modern land transport which in turn greatly encouraged the growth of the rubber industry. The prosperity of these two primary industries resulted in the overall economic development of the west coast and consequently the further development of the transport system of the region. The West Coast Plain then has a well developed system of transport.

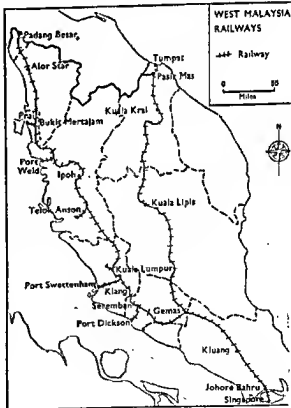
In contrast, the east coast states are poorly served with roads and the so called East Coast Railway not only does not pass through Trengganu, but is also not linked up with the coastal areas except for the northern end of the line.

The movement of goods in and out of the country is, to a greater degree, through the ports which are mainly located on the west, and, to a lesser degree, through the international airport at Subang.

Railways

The Malayan Railway has a total length

of 1,028 miles of main railway lines. The main line, which begins at Johore Bahru, has a southward extension to Singapore. From Johore Bahru it runs northwards through the State of Johore, following an almost central course, serving the oil-palm



and rubber-growing areas around Kulai, Layang Layang, Kluang and Labis. At Gemas, which is situated in the east of Negri Sembilan near the Johore — Negri Sembilan border, the railway branches into two lines, one running north-westwards through all the west coast states, and the other following a northerly course through Pahang and Kelantan and by-passing Trengganu completely.

From Gemas the western line links almost all the important towns in the west coast states, namely, Seremban, Kuala Lumpur, Ipoh and Alor Star. From Seremban a branch line runs to Port Dickson on the coast; from Kuala Lumpur one line runs to Klang and Port Swettenham; in Perak a short branch runs to Telok Anson, a river-port in the lower course of the Perak river; and in Province Wellesley a branch runs from Bukit Mertajam to Prai on the coast opposite Penang. This western line serves the Tin and Rubber Belt. In the north the line continues from Alor Star into Perlis and goes across the border into Thailand.

The East Coast line passes through Kuala Lipis in the north-west of Pahang and ends in the north at Tumpat, near the mouth of the Kelantan river. At Pasir Mas, which lies south of Tumpat, a line runs westwards to join the Thai Railway system.

The western line carries a great deal of bulky freight as well as passengers. Traders usually transport their non-bulky goods in lorries, but the railway provides cheap transport for heavy and bulky commodities such as iron-ore, palm oil, rubber and timber. There is a great deal of freight traffic along the short east-west branch lines from the main line to the ports and in the reverse direction. This goods traffic is heaviest between Kuala

Lumpur and Port Swettenham.

The East Coast line serves a poorly developed and thinly populated area and does not carry enough passengers and goods traffic to pay the costs of running the services. The line does not run parallel to or near the east coast. The coastal areas, except the northern coastal area in Kelantan, are thus without an important means of transport.

Railway construction in West Malaysia has been hindered by the mountain ranges and their steep gradient. Furthermore, the north-south direction of the railway line entails the bridging of many rivers which, in contrast, flow in an east-west direction.

Road Transport

Among the countries of South-East Asia, West Malaysia has about the finest system of roads. This system is particularly well developed in the western region. In the less developed eastern region, however, various road construction projects have recently added considerably to the road mileage and provided access to many more areas. There are altogether more than 7,000 miles of all-weather roads. Over 5,000 miles are metalled roads, and the remaining roads are provided with other types of surfaces.

In the western region are the most important main roads, especially the long north-south trunk road which follows closely the main railway line. The trunk road and railway are usually not more than a few miles apart. In the eastern region the main roads hug the coastline, and with the gaps recently filled it is now possible to travel along the coast road from Kota Bharu in the north to Mersing in the south and continue south-westwards to Johore Bahru, with ferry breaks at a few river crossings.

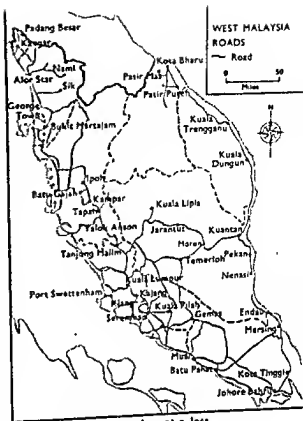
There is an important east-west trunk

road across the Main Range. It runs from Port Swettenham via Kuala Lumpur, Temerloh and Maran to Kuantan on the east coast. Another east-west road farther south crosses the State of Johore from Batu Pahat via Kluang to Mersing on the east coast.

There are many other main roads and feeder roads. The latter feed either the railway lines or the main roads. Apart from the networks of roads in the main towns, there are two large areas with a much denser network of roads than other areas. They are (i) a belt which includes Province Wellesley and the northern part of Perak and stretches from Butterworth to the Kinta Valley; (ii) a belt which stretches along the West Coast Plain, from the Klang river southwards to Muar and includes southern Selangor, Negeri Sembilan and Malacca. In the eastern region a fairly dense network in the delta area of the Kelantan river stretches southwards from Kota Bharu.

The construction of roads in West Malaysia has been facilitated by the abundance of granite and limestone, the two main road construction materials used. The main problem faced in connection with road construction is that of bridging the rivers and this adds considerably to the cost. Though ferries are still used at such points their importance will decline with the building of bridges by the Government.

Road transport, especially the carrying of freight by lorry, has proved a serious rival to rail transport. Traders prefer to transport the less bulky goods in lorries, which can carry them to and from any place served by roads without the trouble of having to transfer them. The Malaysian Railway has suffered from this competition



and usually runs its services at a loss.

Besides the lorries and the large number of cars plying the roads, there are about 700 bus services operating on all the main roads and most of the minor ones.

Water Transport

RIVER TRANSPORT Originally rivers provided

bridging the east-west flowing rivers of West Malaysia will make for a faster and more efficient road transport system. Before this bridge was built, ferries were used to cross the river



the only means of transport and communications in the country. But such importance has declined to a little more than local significance. Small motor launches and sampans are still used by kampong people living on the banks of rivers, but usually only along certain sections of the rivers.

River traffic is more important in the eastern states of Kelantan, Trengganu and Pahang and in the interior of the country. This is because of the scarcity of roads in these areas. But with the expansion of the road system in the eastern region, river transport will decline further in importance.

SEA TRANSPORT The external trade of the country is carried on almost entirely by means of ocean-going ships. Many shipping lines connect the ports of Penang and Port Swettenham with important foreign ports. The port of neighbouring Singapore also has a large share of the external trade of West Malaysia.

Coastal shipping is more important along the east coast than the west coast. Along the west coast, coastal steamers carry rubber, palm oil and other goods from the minor ports to the major ones. But the traffic is not heavy owing to the competition provided by road and rail transport. But along the eastern side of the peninsula, coastal shipping still plays an important part in the carrying of freight, especially goods that are bulky, owing to the absence of a railway line and the less developed state of the road system. However, the lack of good harbours, the presence of shifting sand-bars at the mouth of river and the violent weather during the North-East Monsoon season all combine to make it difficult to develop further the coastal trade along the east coast.

Along both the east and west coasts there are coastal tankers which supply petroleum



WEST MALAYSIA: TRANSPORT

to some of the minor ports. The minor ports on the west coast are, from north to south, Port Weld, Pulau Pangkor, Lumut, Telok Anson, Port Dickson, Malacca, Muar and Batu Pahat. Along the east coast the ports engaged in the coastal trade are Tumpat, Kuala Trengganu, Kuala Dungun (exporting iron-ore), Kuala Kemaman, Kuantan, Pekan and Mersing.

Air Transport

Kuala Lumpur and Penang are the two cities with international airports. The Subang Airport near Kuala Lumpur serves several international airlines, while Penang has air connections with some neighbouring countries.

The Malaysia-Singapore Airlines operates internal as well as international air services. Within the country, the MSA operates flights between seven main towns — Kuala Lumpur, Malacca, Ipoh, Penang, Alor Star, Kota Bharu and Kuantan.

In addition to these seven main airports, there are many other landing grounds for planes. An air service operated by the Malayan Railway provides regular services to about twenty places, including minor towns and other remote parts not served by MSA. To these places are carried newspapers, mail and some passengers. There are about thirty other landing places served by planes on specially-chartered flights.

EXERCISES

1. With the aid of sketch maps write an essay on the internal transport system of West Malaysia.
2. With the aid of a sketch-map, describe the main features of the road and rail communications of Malaya (West Malaysia), and explain why some parts of the country are better served than others.
3. Explain why the western part of the Federation of Malaya (West Malaysia) is more highly developed than the eastern part.
4. Describe the factors which help to account for the scarcity of ports on the East Coast of Malaya (West Malaysia).
5. Make a geographical comparison between the east and west coasts of West Malaysia.

Iran Mountains and the Tama Abu Range. The northward continuation of these border ranges is the Crocker Range in Sabah.

SARAWAK

The State of Sarawak occupies most of the north-western coastal area of Borneo. Its area is 48,250 square miles or slightly less than $\frac{1}{3}$ the area of the island. Its length is about 450 miles and its width varies from less than 40 miles in the south-west to a maximum of about 155 miles in central Sarawak.

Sarawak may be divided into three physical zones:

- (i) an alluvial and swampy coastal plain;
- (ii) a belt of undulating or rolling country broken by mountain ranges and foothills and
- (iii) a mountainous region in the interior along the Kalimantan border.

The coastal plain is very narrow in some parts and more than a hundred miles wide in others. Generally, however, it is fairly wide, varying from 20 to 40 miles in width. It is fringed by beaches which are generally of mud, mangrove or nipah palms. Behind the mud-flats or mangrove swamps along the shore lies the alluvial plain proper. This flat and low-lying plain is composed of material brought down by the major rivers. Much of this plain is subjected to tidal flooding or flooding by river water. This has resulted in the formation of peat swamps and inland freshwater swamps over large areas.

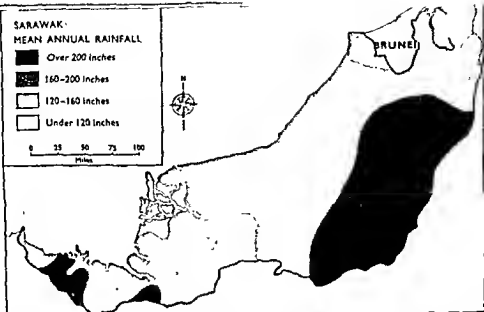
The belt of undulating hill country separating the coastal plain from the mountainous interior is generally free of swamp. It is not a continuous belt, for broad river valleys such as the Rajang Valley and the Baram Valley and a few mountain groups

and spurs branching off the main mountain ranges in the interior break up its continuity.

The third zone is the mountainous interior. This is a rugged and complex region, with mountains, mostly between 4,500 and 7,500 feet in height, intermontane plateaus and deep ravines. The interior mountain ranges form a watershed between the rivers flowing westwards and north-westwards across Sarawak into the South China Sea, and those flowing eastwards and south-eastwards across Kalimantan into the Celebes Sea, the Strait of Makasar and the Java Sea. The ranges do not form a continuous barrier along the border between Sarawak and Kalimantan, for there are gaps through them, especially in the lower south-western ranges. From the Kapuas Hulu Range on the southern border of central Sarawak, the mountain barrier continues without a break northwards into the Iran Mountains and the Tama Abu Range. At the northern end of the Tama Abu Range is the highest mountain in the country, Mt. Murud (7,950 feet). The mountain ranges continue northwards into Sabah as the Crocker Range, which lies along the western side of Sabah.

The main rivers draining into the South China Sea are the Rajang and the Baram. The Rajang river, about 350 miles long, is the longest river in Sarawak. It is navigable by small ocean-going ships as far as Sibu, 80 miles upstream, and by small coastal steamers as far as Kapit, 170 miles upstream. Other long rivers are the Batang Lupar, the Limbang, the Kemena and the Sarawak river on which stands Kuching, the capital of the country. The lower valleys of these rivers are important as areas of settlement and cultivation.

The existence of shifting sand-banks and dangerous sand-bars at or near the mouths of the rivers of Sarawak has made it difficult



to develop deep-water sea ports. The shallow waters along the coast are another handicap to port development. Another hindering factor is that the coast is exposed to the North-East Monsoon and also experiences rough seas from the South-West Monsoon. As a result, there is an almost complete absence of good natural harbours along the coast of Sarawak.

Climature

Sarawak's position, just north of the equator and in South-East Asia, is responsible for its equatorial monsoon type of climate with its high temperatures and heavy rainfall. As in other equatorial regions, the mean monthly temperatures of Sarawak are around 80°F throughout the year. This is true especially of the coastal region. In the higher parts of the hill country the temperatures are somewhat lower on account of the higher altitude. During the wet season, too, lower temperatures are experienced.

Sarawak lies in the path of the North-East Monsoon from the beginning of October to the end of February. The North-East

Monsoon blowing across the South China Sea brings very heavy rainfall during the months of December, January and February. The wettest months are January and February, during which 20 inches or more of rainfall a month is often received.

From April to July or August the prevailing winds are the mild South-West Monsoon winds. This is a relatively dry season, especially during the month of June. Yet there is moderate rainfall during this season, usually more than 8 inches a month, except in the deltaic area of the Rajang river. The rainfall during this season is partly of the convectional type associated with thunderstorms and showers of great intensity, and partly of the monsoon type brought by the onshore South-West Monsoon.

Between the two monsoon seasons there are two shorter transitional seasons of six to eight weeks each. These are periods of calm or variable winds. During these transitional periods there is also rainfall, mainly of the convectional type. Thus there is rainfall throughout the year. The mean annual rainfall is high; for instance, 158

inches at Kuching, 126 inches at Sibü, 145 inches at Kapit and 234 inches at Long Akah (on the upper Baram river). Large parts of the country receive between 120 and 160 inches of rain a year. The rainfall stations at greater elevations generally record higher rainfall figures.

Primary Production

AGRICULTURE

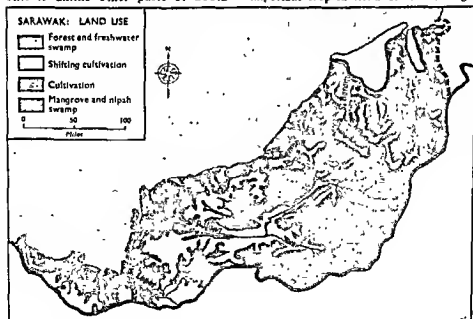
Forests, both equatorial rainforests and swamp forests, cover about three-quarters of the total area of Sarawak. This means that only a relatively small proportion of the total area of the country is devoted to agriculture and other forms of land-use. Although the area under agriculture is small, it is of primary importance in the country. More than three-quarters (78%) of the economically active population is engaged in agriculture. Of the total area devoted to agriculture, about three-quarters is devoted to shifting agriculture and only one-quarter is given over to the settled or sedentary form of agriculture. This is unlike other parts of South-

East Asia where the proportion of land used for sedentary agriculture is very much higher.

The soils are generally of low fertility, and the deep coastal peat swamps give way to undulating hill country with poor soils and to a steep and rugged interior. The most important agricultural land includes the better drained coastal areas between the swamps and the undulating hill zone, and also the raised river levees.

RUBBER is the main crop in terms of total acreage and value and is also the chief export and cash crop. It occupies about 323,000 acres, the majority of which are in smallholdings owned by Chinese, Dayaks and Malays. This is unlike the position in West Malaysia where the large estates play an important role in the production of rubber. The fact that, in Sarawak, the large estates play such an insignificant role may be traced to the Brooke government policy of discouraging estate development in agriculture.

RICE, the chief food crop, is the second most important crop in terms of total acreage.



SOUTH-EAST ASIA

Two-thirds of the padi grown is of the dry variety and only one-third is wet padi. Dry padi is grown all over the country, especially in upland areas where the shifting method of cultivation is practised. This has given rise to tracts of bare hills which induce rapid soil erosion. The Government is, therefore, trying to encourage the farmers to turn to the settled or sedentary form of agriculture, that is, the growing of wet padi.

Wet padi is grown in the deltas of rivers, for instance, the Rajang, and near the banks of the lower courses of rivers. Some wet padi is also grown in the upper reaches of rivers, especially on land between the hills.

The total production of dry and wet padi is not sufficient to meet the needs of the population. About half the state's rice requirements are imported.

PEPPER is the third most important crop. It is the second most important cash crop, after rubber. It is cultivated in small gardens, mainly by the Chinese. Sarawak is a leading pepper-producing country, exporting black and white pepper. Most of the pepper is exported to Singapore, but some good-quality white pepper is exported direct to other countries.

SAGO comes from the sago palm. The palm is about 30 to 40 feet tall and grows best on low swampy ground. Its leaves resemble those of the coconut palm. The sago flour is made from the pith of the tree trunk. Sago is chief food of the people in some parts of the country. Although the sago palm is grown widely throughout the country, the sago industry is confined mainly to the Mukah and Dalat districts in the Third Division and other districts in the Second and Third Divisions. As so much sago is consumed within the country, the total export value of sago flour is only one-fifth or one-sixth that of pepper.



A pepper garden. The pepper plant is trained to twine round a pole.

Other minor crops are coconuts, pineapples and tobacco. Coconuts are grown mainly in the First Division. Not very much copra and coconut oil are exported. Pineapples are grown mainly in the First Division and near Sarikei in the Third Division, but they are not exported from Sarawak. Some tobacco is grown in the Baram district for the making of cigarettes.

TIMBER

Some 6,000 square miles of flat swamp forests form the country's main source of timber. *Ramun* and *jongkong* which grow in these forests comprise the bulk of Sarawak's timber exports. Other types of commercial timber come from the non-swampy forests and are similar to the hardwoods produced in the lowlands of West Malaysia, for example, *kapur*, *keruing* and *meranti* (red, white and yellow).

In recent years, the great expansion in the timber industry has resulted in the total value of exported timber being greater than the combined value of rubber and pepper exports. The flat swamp forests are fully

exploited and expansion of the industry must be towards the exploitation of the non-swampy forests where surveys are being undertaken by the Government.

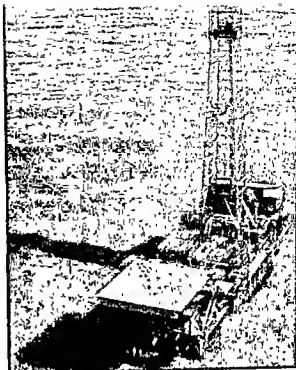
Besides timber, which is exported as round logs and sawn timber, the forests of Sarawak also yield charcoal, jelutong (for making chewing gum), illipe nuts and damar (for making varnish).

MINING

Sarawak is poor in mineral resources. Although there are small deposits of many minerals which have been found and worked, the only minerals of importance are mineral oil and gold, which are worked on a small scale. Rock phosphate, which occurs in many limestone caves, especially in the First and Fourth Divisions, is also produced on a small scale to provide a valuable fertiliser. The mining of bauxite used to be important, but production has recently ceased. GOLD is produced in a few small Chinese-owned mines in the Bau district to the south-west of Kuching. The amount produced, however, is very small and is worth only slightly more than half a million dollars. OIL is worked at Miri in the northern part of the coastal region. Only 125 wells out of about 600 wells are still working. They produce about \$2 million worth of mineral oil which is sent to Lutong, about seven miles to the north, to be refined and exported. Lutong also handles the crude oil from the rich oilfield in Seria, in Brunei. As Lutong is in Sarawak, the import, refining and re-export of Brunei oil form the main trade and industry of Sarawak. The oil exports of Sarawak are worth \$245,000,000 a year.

Industries

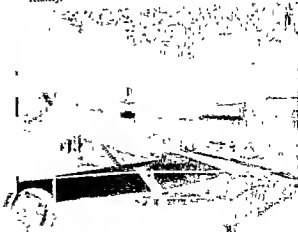
Apart from the refining of petroleum, rubber-milling, sawmilling, sago and copra

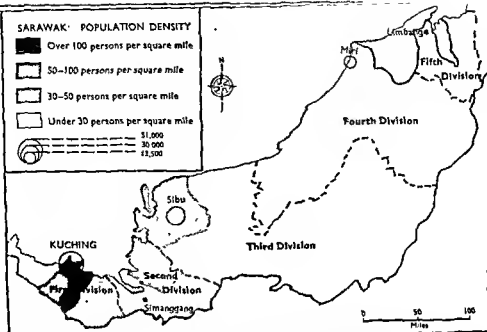


Oil drilling operations are not carried out solely on land. Offshore operations are also carried out in an effort to tap new oil reserves below the sea.

milling and the processing of pepper, there are only small-scale industries producing manufactured goods for domestic consumption. But in recent years there has been a steady expansion of the secondary industries producing goods for the home

Part of the oil refinery at Lutong in Sarawak. Oil from Miri as well as from the rich oilfield at Seria in Brunei is sent by pipeline to this refinery.





market: the manufacture of textiles, soft drinks, soap, cigarettes, metal containers and other goods. With the encouragement by the Government of industrial development in the state, 13 pioneer companies have been established to develop new industries. Other pioneer companies are likely to be formed in view of the attractive incentives offered by way of tax relief, the provision of credit facilities and the development of industrial estates.

Population

The population of Sarawak is about 865,000. As the total area of the country is 48,250 square miles, the population density is very low, being only 18 persons to the square mile. However, the population is unevenly distributed, for large areas of Sarawak are still forested and almost uninhabited. The population is concentrated in coastal areas, especially around the Kuching district which has about one-fifth of the total population. Three-quarters of the population may be found in the First

Division, Second Division and the western part of the Third Division.

In the coastal region, the people live in the drier land between the swamps and hills where padi, rubber, pepper and vegetables can be grown. In the hilly region, people live mainly along the rivers, where padi can be grown. The towns and villages are close to the rivers, and the ports are usually situated some distance upstream.

The greater part of the population consists of Ibans or Sea Dayaks and Chinese. The Chinese now form the largest racial group in the country, comprising about 32% of the total population, with the Sea Dayaks making up about 31%. The Malays are the next most numerous group, forming about 17% of the population. Then there are the Land Dayaks (8%) and the Melanau (6%). The other indigenous groups are small and together comprise only 5% of the total population.

The Sea Dayaks are concentrated in the Third Division though large numbers of them also live in the Second Division and

other parts of Sarawak. Most of the Sea Dayaks live along the banks of rivers and cultivate dry padi in jungle clearings.

The Chinese are mostly found in the First and Third Divisions. Almost 60% of the Chinese live in and around the main towns of Kuching, Sibü and Miri although they are found in many other towns in the coastal region as well. It is the Chinese who carry on most of the trade, plant wet padi, and cultivate rubber, pepper and vegetables.

The Malays live in villages or kampongs near or in the towns, with more than half of the community being concentrated in the First Division. The Melanau, who are allied or akin to the Malays, are most numerous along the coastal areas of the Third and Fourth Divisions, and the production of sago is mainly in their hands.

The Land Dayaks are concentrated in the First Division where they practise shifting agriculture, including the cultivation of dry padi.

The other indigenous people live in long-houses in the interior. A group of indigenous

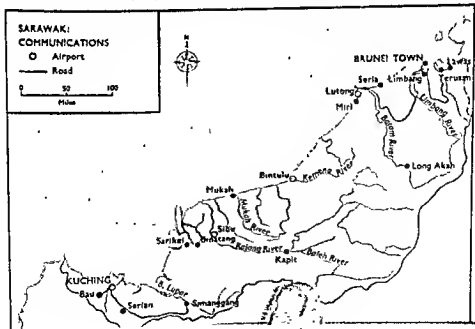
people, the Punans, are forest folk with no settled homes.

Transport

Water Transport

Apart from the mineral oil exported from Lutong near Miri, the produce of the country is mostly transported in boats to the ports not far from the mouths of the rivers. In a country where roads are difficult and expensive to build, the rivers are naturally important highways for transport and communications. In the absence of a good road system, settlements have tended to concentrate near the coast or along the rivers. Goods for export as well as imported goods are water-borne, being carried mainly in motor-boats, cargo launches, longboats, coastal steamers and steamships.

The ocean-going ships make use of only the lower stretches of the Rajang and the Sarawak rivers. They cannot use the Baram river, owing to the sand-bar at its mouth, nor can they sail up the Batang Lupar, which is too shallow. From Kuching, Sibü,



Tanjong Mani and Miri, regular shipping services are operated to link these towns with Singapore, Hong Kong, Japan, Thailand, Taiwan and Australia. Most of the rubber, pepper and crude oil are sent to Singapore from which most of the imports are also shipped. Sibu can now be reached by large ocean-going ships by way of the new Paloh Channel. Tanjong Mani, in Kuala Rajang, is used mainly for loading timber for export.

Along most rivers ply motor-boats, cargo and passenger launches. Along the Rajang river, the motor-boats and launches can reach as far as Kapit which is 170 miles upstream. Beyond this, boats with outboard motors and other small boats are the only means of transport. In the upper parts of rivers, where the rivers are shallow and rapids occur, boatmen have to use paddles or poles to guide their craft.

Coastal steamers also provide an important means of transportation, serving the minor ports as well as the major ones. They ply between Kuching, Sibu, Miri, Bintulu, Mukah and other minor ports. They link these ports with those of Sabah and Brunei.

Land Transport

There is no railway in the country, and there is only a very small road system, consisting of 245 miles of metalled roads, 770 miles of stone or gravel roads and 340 miles of earth roads. The total mileage is small for the size of the country, but there is a large programme of road construction being carried out. There are few good roads outside the towns, as the materials for building roads are scarce and there are large swamps and wide rivers as well as hills to contend with.

The main stretches of roads are (i) from Kuching to Simanggang, (ii) from Miri

to Seria in Brunei, and (iii) from Limbang in the Fifth Division to Brunei Town.

Air Transport

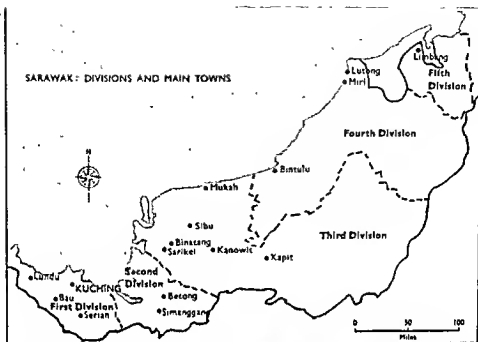
As the road system is poor and travel by river and sea is slow and at times dangerous, air transport offers a popular means of travel for those who can afford it.

Malaysia-Singapore Airlines operates a daily service to Kuching from Singapore and Kuala Lumpur. From Kuching daily services are operated to Sibu, Bintulu and Lutong, from which the route extends to Brunei and Sabah. An internal or rural air service covers Simanggang, Kapit, Limbang, Lawas and other places. The Borneo Evangelical Mission operates an air service to several remote places in the interior, serving the Christian missionaries and sometimes flying out the sick and thus helping to save many lives.

Towns

Kuching (51,000) is the chief town in the First Division and the capital of Sarawak. It is situated on the Sarawak river about 21 miles from the sea. A new port 14 miles from the sea can accommodate ships up to 350 feet long with a maximum draught of 17 feet. A new wharf 800 feet long and new godowns have been built one and a half miles below Kuching. With these and other improved facilities, larger ships than those that previously sailed up the Sarawak river can now reach Kuching or near it and discharge their cargoes.

The town of Kuching is growing rapidly. Its urban population is primarily Chinese who are the chief traders. The Malays and Dayaks live mainly in the suburban areas. Besides being the chief port and airport of Sarawak, Kuching is the focus of a relatively dense network of roads in



the First Division.

Sibu (30,000) is the chief town in the Third Division and the second largest town in Sarawak. It is situated at the head of the delta of the Rajang river, about 80 miles from the sea. Formerly only ships below 2,500 tons could reach Sibu, but with the construction of the new Paloh Channel, it is now accessible to larger ships.

The population consists mainly of Chinese, with Malays, Ibans (Sea Dayaks) and Melanaus living in areas outside the main business quarters. Sibu and other ports lower down the Rajang river, Sarikel, Binatang and Tanjong Mani, handle a large part of the exports and imports of the country.

Miri (13,500) is the chief town in the Fourth Division and the oil town of Sarawak. Although not much oil is produced now Miri handles the import of oil from Seria in Brunei and its re-export through Lutong, about seven miles to the north. Large ships and oil tankers have to anchor three miles out at sea. Lighters handle the general

cargo, while petroleum is loaded onto the tankers through pipes laid under the sea.

Simanggang, on the Batang Lupar, is the chief town in the Second Division, while *Limbang* is the chief town in the Fifth Division. Both are served only by small coastal vessels and river launches. *Bintulu* is the largest of the remaining coastal towns. It is a port at the mouth of the Kemena river and is situated in a non-swampy district. Its recent growth is due to the opening up of its hinterland for rubber growing. *Mukah*, another coastal town, is the centre of the sago industry, where sago is collected and milled in its factories.

SABAH

Sabah, with a total area of 29,388 square miles, is situated in the northern part of the island of Borneo. Latitudinally, it extends from 3° 42'N to 7° 2'N. It is surrounded by seas on three sides and has an indented coastline of about 900 miles. To the west is

Tanjong Mani and Miri, regular shipping services are operated to link these towns with Singapore, Hong Kong, Japan, Thailand, Taiwan and Australia. Most of the rubber, pepper and crude oil are sent to Singapore from which most of the imports are also shipped. Sibu can now be reached by large ocean-going ships by way of the new Paloh Channel. Tanjong Mani, in Kuala Rajang, is used mainly for loading timber for export.

Along most rivers ply motor-boats, cargo and passenger launches. Along the Rajang river, the motor-boats and launches can reach as far as Kapit which is 170 miles upstream. Beyond this, boats with outboard motors and other small boats are the only means of transport. In the upper parts of rivers, where the rivers are shallow and rapids occur, boatmen have to use paddles or poles to guide their craft.

Coastal steamers also provide an important means of transportation, serving the minor ports as well as the major ones. They ply between Kuching, Sibu, Miri, Bintulu, Mukah and other minor ports. They link these ports with those of Sabah and Brunei.

Land Transport

There is no railway in the country, and there is only a very small road system, consisting of 245 miles of metalled roads, 770 miles of stone or gravel roads and 340 miles of earth roads. The total mileage is small for the size of the country, but there is a large programme of road construction being carried out. There are few good roads outside the towns, as the materials for building roads are scarce and there are large swamps and wide rivers as well as hills to contend with.

The main stretches of roads are (i) from Kuching to Simanggang, (ii) from Miri

to Seria in Brunei, and (iii) from Limbang in the Fifth Division to Brunei Town.

Air Transport

As the road system is poor and travel by river and sea is slow and at times dangerous, air transport offers a popular means of travel for those who can afford it.

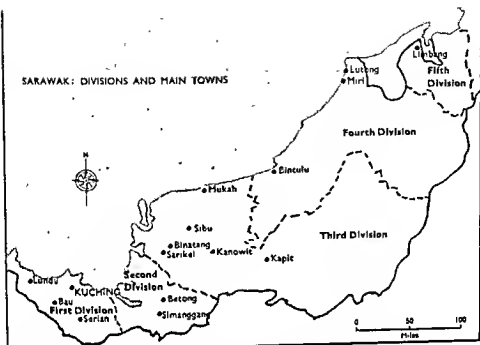
Malaysia-Singapore Airlines operates a daily service to Kuching from Singapore and Kuala Lumpur. From Kuching daily services are operated to Sibu, Bintulu and Lntong, from which the route extends to Brunei and Sabah. An internal or rural air service covers Simanggang, Kapit, Limbang, Lawas and other places. The Bornro Evangelical Mission operates an air service to several remote places in the interior, serving the Christian missionaries and sometimes flying out the sick and thus helping to save many lives.

Towns

Kuching (\$1,000) is the chief town in the First Division and the capital of Sarawak. It is situated on the Sarawak river about 21 miles from the sea. A new port 14 miles from the sea can accommodate ships up to 350 feet long with a maximum draught of 17 feet. A new wharf 800 feet long and new godowns have been built one and a half miles below Kuching. With these and other improved facilities, larger ships than those that previously sailed up the Sarawak river can now reach Kuching or near it and discharge their cargoes.

The town of Kuching is growing rapidly. Its urban population is primarily Chinese who are the chief traders. The Malays and Dayaks live mainly in the suburban areas. Besides being the chief port and airport of Sarawak, Kuching is the focus of a relatively dense network of roads in

SARAWAK: DIVISIONS AND MAIN TOWNS



the First Division.

Sibü (30,000) is the chief town in the Third Division and the second largest town in Sarawak. It is situated at the head of the delta of the Rajang river, about 80 miles from the sea. Formerly only ships below 2,500 tons could reach *Sibü*, but with the construction of the new Paloh Channel, it is now accessible to larger ships.

The population consists mainly of Chinese, with Malays, Ibans (Sea Dayaks) and Melanaus living in areas outside the main business quarters. *Sibü* and other ports lower down the Rajang river, *Sarikei*, *Binatang* and *Tanjong Mani*, handle a large part of the exports and imports of the country.

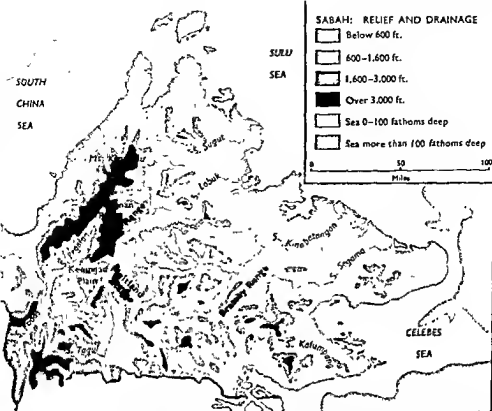
Miri (13,500) is the chief town in the Fourth Division and the oil town of Sarawak. Although not much oil is produced now *Miri* handles the import of oil from *Seria* in Brunei and its re-export through *Lutong*, about seven miles to the north. Large ships and oil tankers have to anchor three miles out at sea. Lighters handle the general

cargo, while petroleum is loaded onto the tankers through pipes laid under the sea.

Simanggang, on the *Batang Lupar*, is the chief town in the Second Division, while *Limbang* is the chief town in the Fifth Division. Both are served only by small coastal vessels and river launches. *Bintulu* is the largest of the remaining coastal towns. It is a port at the mouth of the *Kemena* river and is situated in a non-swampy district. Its recent growth is due to the opening up of its hinterland for rubber growing. *Mukah*, another coastal town, is the centre of the sago industry, where sago is collected and milled in its factories.

SABAH

Sabah, with a total area of 29,388 square miles, is situated in the northern part of the island of Borneo. Latitudinally, it extends from 3° 42'N to 7° 2'N. It is surrounded by seas on three sides and has an indented coastline of about 900 miles. To the west is



the South China Sea, to the east, the Celebes Sea and to the north and north-east lies the Sulu Sea.

Relief and Drainage

Sabah is a country with a hilly and mountainous interior. Bordering this upland interior is a narrow coastal plain on the west and a broader one on the east. The mountains rise sharply from the low hills near the coast and are characteristically rugged, dissected and densely forested. Their forested nature, together with their north-east to south-west trend, have prevented inland penetration of the country, with the result that the interior is underpopulated and underdeveloped.

There are several mountain ranges, the highest of which is the Crocker Range which

lies to the west of the country and runs parallel to the west coast. At the northern end of the Range is Mt. Kinabalu (13,455 ft.), the highest mountain in Borneo and insular South-East Asia.

To the east of the Crocker Range lies the Trus Madi Range where Mt. Trus Madi, the second highest mountain in Sabah, reaches over 8,500 ft. in height. In the south-east is the Brassy Range.

The whole of the interior between the Crocker Range and the border with Indonesia, excluding the interior plains of Keniogau and Tambunan, is a mountainous and highly inaccessible area. Inland from the coastal plain, stretching from Tawau to Lahad Datu, is also a mountainous and undeveloped area.

Between the Crocker Range and the sea

lies the west coast plain. North of Kimanis, the west coast plain is narrow but south of Kimanis, it broadens into a wide alluvial plain. It is on this coastal plain and along the foothills of the Crocker Range that most agricultural development has taken place. This is also the most populated region of Sabah. The extensive alluvial plain in the south is drained by the Padas river which flows through a gap in the Crocker Range after being joined by the Pegalan river at Tenom. The Pegalan river flows through two interior plains — the Tambunan plain and the Keningau plain. The Tambunan plain is an important agricultural area, with several thousand acres of irrigated padi land.

Along the east coast there are extensive alluvial flats, especially along that part of the coast facing the Sulu Sea. There are also large fertile areas in the Semporna peninsula and the lower Segama Valley. The volcanic soils in the Semporna peninsula and the alluvial soils in the Segama Valley are most suitable for the cultivation of the oil-palm, tobacco and abaca (manilla hemp).

There are many rivers which flow outwards from the mountainous interior into the surrounding seas. The rivers flowing westwards into the South China Sea are short and swift, and therefore unimportant as a means of transport and communication. The river Padas is the longest of these.

The rivers of the south-east, which empty into the Celebes Sea, are similarly short and are further characterised by rapids along their courses, which have tended to reduce their importance as highways.

In contrast, the rivers which empty into the Sulu Sea are long and form natural highways of communication. The Kinabatangan, the longest river in Sabah, is navigable by launches for 120 miles. The

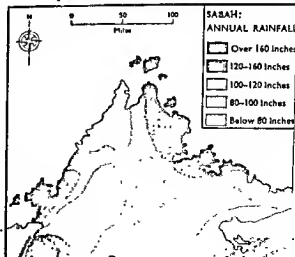


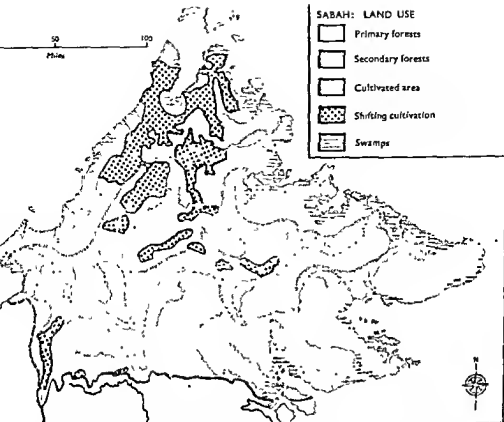
Mt. Kinabalu (13,455 ft.) — the highest mountain in Borneo and insular South-East Asia.

Segama, another large river, is navigable by launches for 60 miles. Other large rivers are the Sugut and the Labuk.

Climate

Sabah's climate is similar to that of Sarawak's, with uniformly high temperatures throughout the year, modified by altitude in the mountainous interior. There is high humidity and rainfall throughout the year, but the rainfall is generally less heavy than in Sarawak. The mean annual rainfall varies from 70 inches to 120 inches in most places, with some rainfall stations recording an annual rainfall of between 120 and 160 inches. The amount of rainfall depends on location, and the pattern of rainfall distribution is





complex, compared to that of Sarawak.

The prevailing winds are the North-East Monsoon from October to March, and the South-West Monsoon from May to September. Between one monsoon and the next, there is a short period of a few weeks when the winds are variable.

The heaviest rainfall occurs in the south-west, that is, the section of the west coast south of Kota Kinabalu to the Sarawak border. The parts with the lowest rainfall are the interior and the south-eastern part around Tawau. The west coast is so situated that its southern section receives rain from both the South-West Monsoon and the North-East Monsoon, but the South-West Monsoon season is the wetter one. On the east coast, however, the heaviest rainfall occurs during

the North-East Monsoon season.

Primary Production

Primary production is still very important in Sabah. More than 75% of the working population is engaged in the production of agricultural products both for subsistence and for export. The main export commodity by value is timber, followed by rubber.

TIMBER

The forests in Sabah cover more than three-quarters of the total land area of the country. They provide the country with a flourishing timber-extraction industry. This industry is responsible for more than 70% of the export earnings of the state, and accounts for one-quarter of the world's

export and the second most important export commodity. The acreage under rubber has almost doubled during the last ten years. Although exports have risen in recent years, the export value has dropped owing to the falling prices of rubber. The growing of rubber has been concentrated along the west coast, partly because of the existence of a railway and partly because the land on the whole is less swampy and better drained than the east coast region. The rubber belt along the west coast stretches from Kota Kinabalu (Jesselton) southwards to the border of Sarawak, and is served by the only railway line in the country. Minor areas of cultivation are near Sandakan and Tawau in the east coast.

PADI Sabah grows proportionately more padi than Sarawak and is able to meet about two-thirds of the needs of the population. Unlike Sarawak, wet padi occupies more acreage than that of dry padi. The acreage under wet padi has steadily increased during the past ten years, although not at the same rate of increase as that of rubber. However,

Padi-fields at Kota Belud. The huts in the background belong to the farmers.



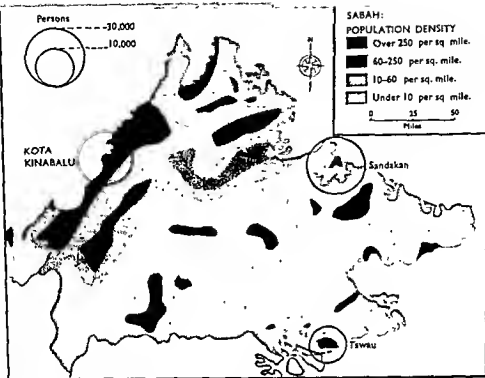
Timber, one of the main products of Sabah, is shown here being removed from the jungle near Lahad Datu.

supply of hardwood logs. The industry is well developed and hand method of logging has largely given way to mechanical methods of extraction. Most of the exports are in the form of round logs. Sawn timber, veneer and plywood are also exported, but in much smaller quantities. The sawmill industry has expanded, but not to the same extent as in West Malaysia or Singapore.

The timber industry is in the hands of large companies formed with foreign and local capital. It is concentrated mainly in the east coast, where there are large timber forests. The largest production comes from the area around Sandakan. Next in importance is the Tawau area in the south-eastern corner of the country. Another area is near Lahad Datu. These lumbering districts are mainly along the east coast. Timber production along the west coast is on a smaller scale. The deep-water harbours in Sandakan and near Tawau and the many rivers suitable for transporting the logs have helped to make the industry a thriving one in the east coast.

AGRICULTURE

RUBBER is the most important agricultural



there are schemes to open up more wet padi land.

Three main forms of padi are grown: wet padi, dry hill padi and dry lowland padi grown in rotation with other crops. Wet padi occupies more than two-thirds of the rice acreage, mainly in the alluvial plain of the west coast. Most of the wet padi farmers depend on rain or on primitive methods of irrigation, but at Papar, Tuaran and in the Klias peninsula there are irrigation schemes to ensure adequate supplies of water. Dry hill padi is grown mainly by shifting cultivators, but this is discouraged by the Government as it leads to severe soil erosion. Dry lowland padi is grown in areas in the west coast where the rotation of crops is practised and the land is fertile enough for more than one crop a year to be raised.

The main padi-growing areas in the west coast are around Papar, Tuaran, Kinta

Belud and Kudat, as well as the interior plains of Tenom and Tambunan.

COCONUTS are the second most important cash crop, as copra forms the third most important export commodity after timber and rubber. The total acreage under coconuts has increased in recent times. The main coconut growing areas are Kudat in the north, and Tawau, Lahad Datu and Sandakan in the east coast. Very little coconut oil is exported, and coconut exports are mainly in the form of copra imported from neighbouring parts of Indonesia for re-export.

OTHER CROPS The oil-palm, abaca (manila hemp) and cacao are all important plantation crops concentrated in the Semporna peninsula where the rich volcanic soils and the climate are most favourable for their cultivation. There has been a great extension of oil-palm cultivation and 14,000 more acres

are being opened up. Palm oil is now the fourth most important export commodity, having displaced abaca. Abaca is cultivated in several estates, occupying 4,500 acres, in the Semporna peninsula. Cacao is grown in a small area near Tawau, while tobacco is cultivated by smallholders as well as in a large plantation near Lahad Datu.

Population

With a population of more than 550,000 and a population density of only 18 to the square mile, Sabah is sparsely populated. It is a mountainous country still largely covered with dense equatorial rainforests and is still relatively undeveloped. About half its population is found in the West Coast Residency, where the population density is over 40 to the square mile. But the east coast has a density of less than 10 per square mile, mainly because of the large areas of forest and swampland.

The population consists of Kadazans, Chinese, Bajaus, Muruts and others. The *Kadazans* form nearly one-third of the population. They live mainly on the west coast and the interior plains of Tambunan and Ranau. They are the chief padi growers

A Bajau maiden



A Kadazan maiden

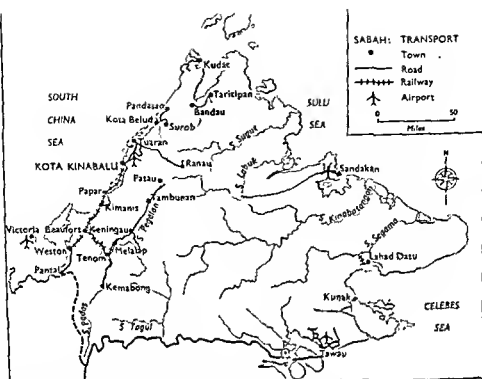
in the country. The *Chinese* form almost one-quarter of the population. Most of them live in and around the towns, especially Kota Kinabalu, Sandakan, Kudat and Tawau. In the towns they engage in trade and commerce, or work as craftsmen and workers in small-scale industries. Many also live in rural areas, where they are engaged in the cultivation of rubber, rice, coconuts, fruits and vegetables and the rearing of pigs. The majority of the Chinese in Sabah are Hakkas, but in Sandakan the business community consists mostly of Cantonese, while in Kota Kinabalu the traders are mostly Hokkiens.

The *Bajaus* are seafaring folk living mostly on the east coast where their main occupation is fishing. A large number of Bajaus live in the Kota Belud district, where they rear cattle and ponies and also cultivate rice. The *Muruts* are hill people living mostly in the south-west of the country, especially in the mountainous interior bordering Sarawak and Kalimantan.

Towns

Kota Kinabalu

Kota Kinabalu, or Jesselton, (21,500) is the



capital of Sabah and the second largest town in the state. It is centrally situated on the west coast. As the chief port serving the West Coast Residency and the northern terminus of the railway, it is the chief outlet for the rubber produced in the rubber belt. The railway has its terminal at the town's wharf. The wharf can accommodate two ocean-going vessels and two coastal steamers. The ships transport most of the rubber to Singapore.

Sandakan

Sandakan (30,000) is the largest town and chief port of Sabah. It has a large natural harbour which, however, suffers from the disadvantage of having a bar at its entrance. The depth of the water at the bar is only 23 feet, so that only vessels with 22 feet draught or less can enter the harbour. Timber is exported from Sandakan mainly to Japan, Hong Kong and Australia.

Tawau

Tawau (10,500), the second most important port on the east coast, is situated near the Kalimantan border. It has more varied exports than the other ports and its chief exports include timber, copra, rubber, hemp.

Labuan

Labuan (3,500) is the second most important port in Sabah, after Sandakan, but it handles little of the trade of Sabah. Instead, it handles goods mainly for transshipment to and from Brunei, including imports for the Seria oilfield in Brunei. It is an important bunkering or fuelling port and can handle large ships with draughts of up to 30 feet.

Lahad Datu

This is another important port on the east coast situated at the head of Darvel Bay. It carries on a brisk trade in copra with the

neighbouring Sulu Islands and the Philippines. It has facilities for the direct shipment of goods to Singapore.

Kudat

Kudat is a port on the northern coast serving the district around Marudu Bay. It exports the rubber and copra produced in the north.

Trade

The total value of the external trade of Sabah is more than \$700 million a year. The leading export commodity is by far *timber* which recently accounted for more than 70% of the total value of the country's exports.

Rubber is the second principal export commodity, but its total value is only one-ninth that of timber. The production of rubber has declined owing to the serious shortage of labour and the falling prices of rubber. *Copra* is the third main export item. Other export commodities include dried and salted fish and prawns, palm oil, abaca and cocoa beans.

The chief commodities imported are machinery, provisions, tobacco and cigarettes, oil, metals, rice, textiles and vehicles.

Transport

Sabah has a higher road mileage than Sarawak but it is still very inadequate. A large sum of money has been set aside to improve the transport system. This will help to bring about greater all-round development in the state. The total road mileage is 1,440, of which only 260 miles are bitumen-surfaced. Work is in progress on a network of roads to link the centres of trade and population and also to improve the rural road system. There is a scheme to build a 238-mile trunk road linking Kudat

in the north to the Sarawak border in the south-west of the country.

There is a 116-mile railway which serves the southern part of the west coast and part of the interior. It runs from Kota Kinabalu (Jesselton) southwards to Papar and Beaufort. From Beaufort it runs through a gap in the Crocker Range to Tenom in the interior and continues to its terminus at Melalap. A branch line runs from Beaufort to the coast at Weston. This line serves the rubber estates and smallholdings, timber logging camps and sawmills in the district.

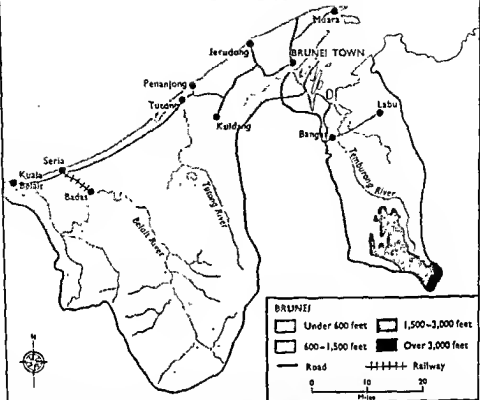
Small river craft along most of the rivers provide the chief means of transport throughout the country, especially for the rural people. The Kinabatangan and Segama rivers on the east coast are navigable by motor launches for 120 miles and 60 miles respectively.

Sabah is better endowed with ports than Sarawak as the coastal waters are deeper and there are more sheltered inlets. There are fourteen ports and timber loading points. Of the ports, Sandakan and Labuan handle the largest tonnage of cargo.

Regular air services operated by Malaysia-Singapore Airlines connect Sandakan, Kota Kinabalu and Labuan with Kuching, Kuala Lumpur, Singapore and other foreign cities such as Hong Kong and Manila. As in Sarawak, the internal air services provide very important links between centres not served by roads or railway or served only by very slow means of communication.

BRUNEI

Brunei is a small state of only 2,226 square miles, situated between the larger states of Sarawak and Sabah. Apart from its sea frontage, it is bounded on all sides by Sarawak, which also splits the state into two



separate and unequal parts. The smaller eastern part is more hilly than the western part and is relatively undeveloped and backward. The larger western part is more developed and includes the Seria oilfield and the district around the capital, Brunei Town.

The climate of Brunei is similar to that of Sarawak's. Its annual rainfall varies from 100 inches in the coastal areas to over 200 inches in parts of the interior.

The population of Brunei is about 125,000. The majority of the people are Malays (over 50%). The Chinese form about 25% of the population, while the remaining 25% consists of Indians, Ibans (Sea Dayaks) and others.

Brunei Town (53,000), the capital of Brunei, is situated nine miles up the Brunei river. The Brunei District centred on this town has the largest concentration of people. The

Belait District in the western part of the country has the next largest concentration of people, as it includes the busy Seria oilfield. The other districts are sparsely populated.

The Seria Oil Industry

The oil industry is the backbone of the economy of the state. The oil exports form more than 99% of the total value of all exports. The value of oil exports amounts to \$200 million a year. In comparison, the value of the exports of rubber, the next most important export commodity, is only \$1 million a year.

The oilfield at Seria produces about 22 million barrels of oil a year from its 350 wells. It used to produce more, but it has now passed its period of peak production. But a recently developed offshore oilfield is very productive, adding another 13 million barrels of oil a year

to the total production. The offshore wells, which number less than twenty, are operated undersea at a distance of a mile or more from the coast.

The oil from Seria is piped to Lutong in Sarawak, where part of it is refined in a large refinery. The crude oil and refined oil are then shipped from Lutong to Singapore and other ports.

Agriculture

Apart from petroleum and natural gas, there are some exports of rubber, jelutong and pepper. In value these products do not amount to even 1% of the total value of exports. But as oil production is an exhaustive industry, the Government is encouraging more agricultural production and the cultivation of a greater variety of crops. Rubber is grown in all parts of the state, but the production is small, and the rubber sheets are exported to Singapore.

Rice, the main food crop, is cultivated in small areas mainly as wet padi. Only one-third of the state's rice requirements are met from local production and the rest have to be imported. Pepper is grown mainly at Labi in the Belait District. The pepper is not processed, but exported in the form of

white or black pepper.

There is also a small timber industry producing sawn timber and logs of light hardwoods and medium hardwoods. The timber is exported mainly to Australia.

Transport

Brunei is served by two shallow river ports: Brunei Town and Kuala Belait. A deeper harbour, Muara Harbour, is used for ships of the British Navy for loading and discharging military cargo.

Air services from Brunei Town to Kota Kinabalu, Kuching and Singapore are operated by Malaysia-Singapore Airlines and to Hong Kong by Cathay Pacific Airways.

There are 230 miles of roads in the country, including a trunk road between the capital, Brunei Town, and the oil-towns of Seria and Kuala Belait. This coastal road is extended into Sarawak as far as Miri and beyond. There are short branch roads leading from the trunk road to the coast. There is, however, only one good road leading from the coast to the pepper-growing district of Labi in the interior. The Government has started on a programme to extend the road system.

EXERCISES

1. Under the headings of position, size, relief, drainage, population, towns and economic activity, compare Sabah with Sarawak.
2. Describe the physical geography of Burma or Sarawak and Sabah under the headings relief and drainage, climate, vegetation and soils.
3. Write an essay on the population composition and distribution of Sabah and Sarawak.
4. What is the total population of East Malaysia? What is the total area of its two states? How do these figures compare with those of West Malaysia? Account for the differences.
5. Write a brief geographical account of the former British Borneo which is now politically separated into East Malaysia and Brunei.

Chapter 11

The Republic of Singapore

The Republic of Singapore consists of Singapore Island and some forty-odd adjacent islands and islets, most of which lie to the south of the main island. Singapore is situated off the southern tip of West Malaysia and is separated from West Malaysia by the Strait of Johore, which is about three-quarters of a mile in width. Singapore Island is, however, joined to West Malaysia by a causeway which carries a road, a railway, water mains and cable connections.

Singapore Island measures 26 miles at its greatest length from east to west and 14 miles at its greatest width from north to south. The total area of the island is 209.5 square miles. The total area of the

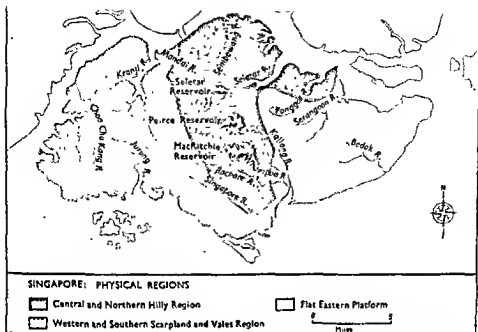
neighbouring islands and islets is only about 15 square miles, giving the overall total area of 224.5 square miles for the Republic. Of the neighbouring islands of Singapore Island, the largest are Pulau Tekong, Pulau Ubin and Pulau Blakang Mati.

Singapore is situated very near the equator. The heart of the city area in the southern part of the island lies on latitude $1^{\circ}17'N$ and longitude $103^{\circ}50'E$.

Physical Features

The Island of Singapore has very low relief, the whole of its land surface being below 600 feet. Such relief is usually classified as lowland. However, three physical





regions may be distinguished: (1) the Central and Northern Hilly Region; (2) the Western and Southern Region of Scarpland and Vales; and (3) the Flat Eastern Platform.

1. THE CENTRAL AND NORTHERN HILLY REGION

In this region is found the granitic igneous core of the island. The granite mass of central uplands once covered by sedimentary rocks has been worn down by erosion to reveal the granite and other coarse-textured igneous rock. These uplands now form rounded and undulating surfaces averaging some 200 feet in height. This low undulating area is bordered on the west by a higher range of hills, including Bukit Timah (581 feet), Bukit Gombak (437 feet), Bukit Panjang (434 feet) and Bukit Mandai (422 feet).

Most of the rivers on the island have their sources or some of their headstreams in this region. They flow northwards, north-eastwards and south-eastwards. Among them are the Mandai river, the Sembawang river, the Seletar river, the Kallang river,

the Whampoa river and the Rochore river.

A large area of the central hilly region, comprising some 13 square miles, forms the catchment area for these rivers and especially for the reservoirs constructed by damming the upper valleys of the Seletar river (Seletar Reservoir), the Kallang river (Peirce Reservoir) and the Whampoa river (MacRitchie Reservoir). The catchment area also includes specially protected Nature Reserves in which human settlement and tree felling are prohibited. The Bukit Timah Nature Reserve, covering about 165 acres on the highest hill on the island, has a very important collection of botanical specimens as well as a virgin equatorial rainforest with trees 150–200 feet in height.

2. THE WESTERN AND SOUTHERN SCARPLAND AND VALES REGION

This is a region composed mainly of sedimentary sandstone and shale. The sandstone and shale form a series of scarps and ridges with intervening vales. The scarps and ridges are made up of harder



The Island of Singapore has very low relief. No part of the island is higher than 600 feet above sea level. Some of the hills are being levelled and the earth used in land reclamation projects.

sedimentaries, especially sandstone, while the vales between them are formed of softer rocks, especially shale. The better known of the ridges are the Sesop Ridge, the Pasir Panjang Ridge and the Mount Faber Ridge, which are about 350 feet in height. There are many other smaller ridges, scarps and

low hills. The main rivers draining this region are the Kranji river, the Choa Chu Kang river, the Jurong river and the Singapore river. At the mouth of these rivers and along stretches of the west coast are mangrove swamps, parts of which have been reclaimed.

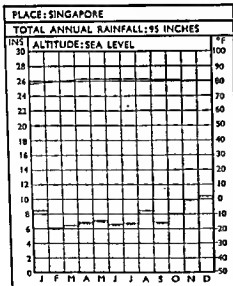
3. THE FLAT EASTERN PLATFORM

The eastern third of the island is less hilly than the other two regions, as it consists of a level platform of old alluvial sand and gravel. The surface of this generally flat platform is rarely broken by hills. The average elevation of the eastern platform is between 50 and 100 feet. The main rivers draining this region are the Ponggol river, the Serangoon river and the Bedok river. The first two in the north-east have mangrove swamps at their mouths, while the sea coasts in the east and south-east have sandy beaches.

Climate

Singapore has an equatorial climate because of its low latitudinal position, but this climate is modified by monsoonal effects and insularity. The position of the island is such that it lies in the paths of seasonal air streams converging near or crossing the equator, resulting in heavier rainfall during certain months of the year. The climate is thus dominated by uniformly high temperatures throughout the year, high humidity and abundant rainfall all the year round.

The average maximum temperature for the year is 87°F and the average minimum temperature is 74°F, so that the mean *annual* temperature is about 80°F. The mean *monthly* temperature seldom rises above or falls below the mean annual temperature by more than 2°F. This means that the annual range is seldom more than 4 degrees.



There is rain during all the months of the year, so that usually there is no well-marked dry season, although in some years less than two inches of rain is received during certain months. On the average, the months of February, May, June and July are slightly drier than the other months, with less than 7 inches per month. The months of November, December and January, coinciding with the North-East Monsoon, are slightly wetter months, with about 10 inches or more. December is usually the wettest month, sometimes with 15 to 18 inches of rain. The average annual rainfall is about 95 inches. This average does not reveal the fact that in some years the annual total is only about 70 inches, while in others it is more than 110 inches.

While the average annual rainfall for the whole island is about 95 inches, the northern parts of the island, especially the north-central portion in the catchment area, receive more than 100 inches a year. The southern parts of the island receive on the average less than 80 inches a year.

The prevailing winds from November

to April are from the north or north-east, while from May to October the prevailing winds are from the south or south-west. But there are many days during these two periods when the winds come from other directions. Between the monsoon seasons there are periods of calms or of variable winds.

Singapore is also affected by squalls or *sumatras*. These are strong winds which blow from Sumatra across the Strait of Malacca. These *sumatras* are accompanied by torrential rain which may cause local floods and damage to property.

Primary Production

In Singapore the main primary industries are agriculture and fishing, there being no mining and lumbering as in West Malaysia. Land for agriculture is very limited and inshore fishing grounds are also very restricted. Although steps have been taken by the Government to increase the output of primary products, more attention is now given to the promotion of secondary industries and trade.





AGRICULTURE

In terms of acreage the most important crops cultivated are rubber, coconuts, vegetables and root crops, fruits and tobacco. But in terms of production, vegetables are easily the first in importance, followed by root crops, coconuts, rubber, fruits and tobacco.

Rubber used to cover some 15,000 acres, mainly in the northern parts of the islands. It is still grown in smallholdings and a few estates, but the yield is poor and the total production is very insignificant. Coconuts are grown mainly in the sandy eastern half of the island, especially at Ponggol and Changi. There are no large coconut estates producing copra for export, and the several million nuts produced annually are all sold locally for human consumption. With the scarcity of land for building and industrial purposes and with the prices of land steadily increasing, owners of rubber and coconut land find it more profitable to sell their land than cultivate it, so that every year the

acreage of rubber and coconut holdings is fast dwindling.

The growing of vegetables, root crops and fruits is a much more important form of primary production. As the population of Singapore is comparatively large, consisting of about two million people, the market-gardeners find a large local market for their produce. The market-gardeners are mostly engaged in mixed farming, including the growing of vegetables and root crops such as sweet potatoes and tapioca, the raising of pigs and poultry and the rearing of freshwater fish. Some of them specialise in the intensive cultivation of vegetables for sale. As the availability of water supply is the first consideration and the fertility of soils another, the Chinese market-gardeners generally occupy flat and low-lying areas in river valleys or near streams, especially in the valleys of the Kallang and the Kranji rivers. In higher areas farmers grow mainly the root-crops in rotation with tobacco, as well as keep livestock such as

pigs and poultry.

The rearing of poultry for eggs and meat and of pigs and fish has become a major rural industry. The production of pork, poultry and eggs has greatly increased in recent years, so that Singapore has become largely self-sufficient in its requirements for these protein foodstuffs.

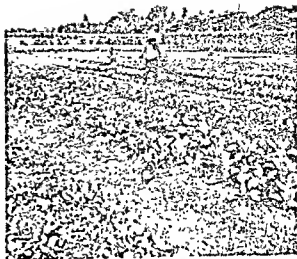
An important development in vegetable farming is the use of reclaimed swampland. A wide range of vegetables and root crops are being grown on land reclaimed from mangrove swamps and bunded to prevent the entry of sea water. This is mostly done on an experimental scale, but with the success of the venture there is every likelihood of such areas of cultivation being extended.

FISHING

There are more than 4,000 people engaged in fishing, of whom nearly 80% are Chinese and the remainder Malays and others. About 60% of the fishermen are engaged in inshore fishing, but they are responsible for only about one-quarter of the total amount of fish landed. This is because they have very limited fishing grounds, namely, the inshore areas surrounding the Republic. The reclamation projects along the coast and the pollution of water by industrial waste as well as oil from ships are other handicaps. Besides using fishing stakes (*kelongs* and *belats*), seine nets, drifts nets, push nets, fixed barriers and portable traps, the fishermen make use of non-powered boats as well as boats powered by outboard motors.

In contrast, the off-shore fishermen, forming only about 40% of the total number of fishermen, land about 75% of the total catch of fish. They use larger boats powered by inboard engines and operate in the South China Sea and the Indian Ocean.

To encourage the expansion of off-shore



A Chinese market garden in Potong Pasir
Farms like this supply the people of Singapore
with fresh vegetables

fishing, a modern fishing port has been developed at Jurong. Joint trawling projects have been started with foreign deep-sea fishing companies, loans have been given to fishermen to help them buy modern equipment and modern methods of fishing are taught to fishermen at a fishing training centre.

There are also inland fisheries in the forms of freshwater fish ponds and brackish water prawn ponds. The common carp, the grass carp, the silver carp and the big head are among the fish reared in the freshwater fish ponds. Prawn trapping takes place in prawn ponds formed by enclosing swampy areas in the tidal basins of rivers, especially along the west coast.

Owing to the insufficient quantities of fish landed by Singapore fishermen, large quantities of fresh fish have to be imported. About 90% of the imported fresh fish come from West Malaysia.

Trade

Trade has been and still is the life-blood of Singapore. Although secondary industries are developing, they are really not on a very

SOUTH-EAST ASIA

large scale and the total value of their output is relatively small compared with the total value of the external trade.

Unlike West Malaysia, whose external trade is mainly of the purely import-export kind, Singapore does not have large quantities of primary products such as rubber, tin, timber and palm-oil to export. Singapore has to depend on entrepot trade, that is, the import of these products and then the re-export of them. Singapore earns a large income for its services in handling this large trade.

A combination of several factors have led to the growth of Singapore as a great regional and international trading centre.

1. The chief factor is the geographical position of Singapore in relation to the major trade routes of the world and to the countries of South-East Asia. Situated off the southern

end of peninsular Malaysia which is also the southernmost tip of mainland Asia, and at the southern part of the important Strait of Malacca, Singapore occupies a strategic position on the major lanes of maritime traffic between the Indian and the Pacific Oceans. It also commands the traffic between the Indian Ocean, north of the equator, and the major islands of South-East Asia. Singapore is thus able to tap not only the trade between Europe and the Far East but also the regional trade of South-East Asia.

Singapore is also, in a way, centrally situated in relation to its nearest neighbour, West Malaysia, and its position in this respect enables it to tap the resources of both the west coast and east coast regions of West Malaysia. In fact, West Malaysia supplies a great proportion of the primary

Today the Port of Singapore is the fourth largest sea-port in the world, making the island a leading international trading centre. Efficient and speedy handling of cargo is one of the factors that have contributed to the port's present status.



produce handled by Singapore in its entrepot trade.

In relation to another close neighbour, Sumatra, Singapore's geographical position is also very advantageous for it is centrally situated off the east coast of Sumatra. Traders along the greater part of the east coast of Sumatra find it more convenient to trade with Singapore than with Jakarta in Java, the capital of Indonesia.

Singapore is not really centrally situated in relation to the whole of South-East Asia. But it is the focal point in the region, partly because of its advantageous position on the major East-West trade routes. Penang and Port Swettenham, for instance, also lie on these routes, but they are farther than Singapore from the ports on the east coast of peninsular Malaysia and the ports of East Malaysia (Sarawak and Sabah), and much farther from the areas further east, such as Kalimantan, Sulawesi (Celebes) and Maluku (Moluccas). Jakarta, too, cannot compete with Singapore in geographical position, owing to its being too far south of the major shipping routes.

2. Another important factor in the growth of Singapore's trade is its fine natural harbour which is the best within a radius of a thousand miles. In addition to its deep, well-sheltered and commodious harbour, there is a full range of port facilities available.

3. Singapore used to attract trade owing to its free port status. This status was enjoyed only by Singapore and Penang in the whole region of South-East Asia. The free port policy worked in conjunction with the other factors to help Singapore become the premier regional and international entrepot port in South-East Asia. But much of this free port status has been lost with the imposition of duties on a wide

range of goods imported for internal consumption. To safeguard the entrepot trade, Free Trade Zones have been established. With the establishment of these zones import duties are not imposed on goods imported into the country merely for re-export and not for sale in the local market. Within these zones bonded warehouses have been provided for merchants to store goods and to break bulk, for re-sorting and re-packing.

4. Other factors in the development of Singapore's entrepot trade include the expert knowledge and extensive business connections of the Chinese, European and other merchants, the ample banking facilities, the facilities for processing, grading and re-packing the products brought to the port, and the wide range and ample stock of products needed by most traders.

The Port of Singapore

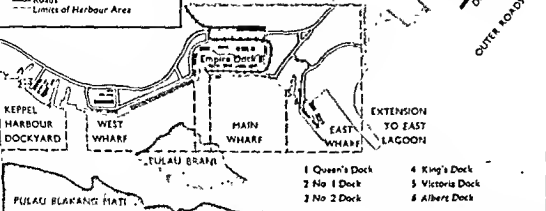
Singapore is the fourth largest sea-port in the world in terms of the total tonnage of ships cleared at the port. It ranks fourth after Rotterdam, New York and Yokohama. It is the largest port in the Commonwealth, having outstripped London in the tonnage of ships cleared. The total tonnage of ships handled by the port amounts to more than 103 million tons.

The importance of the Port of Singapore has been largely due to the island's strategic geographical position in relation to the world's major trade routes and the deep, sheltered natural harbour with its excellent facilities. Its rich hinterland of West Malaysia, from which come the important products of rubber and tin, is another significant factor.

The port, administered by the Port of Singapore Authority, is divided into (i) the Keppel Harbour which lies to the west of the city, and (ii) the Roads.

THE PORT OF SINGAPORE

-  Workshops
-  Storage Warehouses
-  Transit Sheds
-  Railway Station
-  Railway
-  Roads
-  Limits of Harbour Area

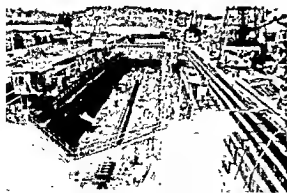


The main harbour area is sheltered by the off-shore islands of Blakang Mati and Pulau Brani. The large ocean-going ships can berth alongside the deep-water wharves at Keppel Harbour which, with its 3 miles of wharves, can accommodate at the same time 25 large ocean-going ships and 5 coastal steamers. The wharves are the West Wharf, the Empire Dock, the Main Wharf and the East Wharf. To the north-east of the East Wharf is the East Lagoon, which is being developed to provide four new berths for

large ships and facilities for handling containerised cargo. There are also six dry docks for the repair of ships. The dry docks are No. 1 and No. 2 Docks, King's Dock, Queen's Dock, Victoria Dock and Albert Dock. Within this main area are 40 acres of covered storage space.

To the north-east of the main harbour and near the mouth of the Singapore river are the roadsteads for ships to anchor without berthing alongside a wharf. These are the Inner Roads and the Outer Roads, which are separated by a detached mole forming a breakwater to provide shelter for ships in the Inner Roads. The Roads are used by ships whose owners do not wish to pay the port dues charged for the use of wharves in the main harbour. They are also used by ships waiting for their turn to use the berths alongside the wharves. The ships in the Roads have their goods transferred by lighters (tongkangs) which use the quays alongside the Singapore river. Opposite the Inner Roads is the Telok Ayer Basin which is used for handling cargoes brought by ships from Hong Kong, Taiwan and

The picture shows a floating dock, which is used especially in emergencies for the repair of ships which are unable to go into a dry dock.



China. Barter traders from Indonesia call at South Winds at the mouth of the Jurong river.

At Jurong, too, there are wharves with deep-water berths for the largest ships and dockyards for the repair of ships. There are also coastal wharves, including facilities for a modern fishing port.

Among the ships using the harbour and Roads, the majority are British vessels. Next in number are Liberian, Norwegian, Japanese and Dutch ships. Smaller numbers of ships from many other countries also use the Port of Singapore.

Large sums of money are being spent to make further improvements of the harbour and dock facilities. Among the latest improvements, for instance, is a giant godown at the West Wharf measuring 780 feet by 120 feet. There are special facilities for the transshipment of goods from large ships to coastal steamers which distribute the goods to West and East Malaysia, Thailand and Vietnam. The ample facilities and the highly efficient services available for all types of ships will continue to keep the Port of Singapore well ahead of any rival ports in the region.

CHIEF COMMODITIES OF TRADE

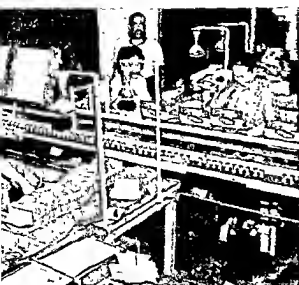
Since all the countries of South-East Asia except Laos are engaged mainly in seaborne trade, they find it convenient to send much of their primary produce to Singapore for transshipment to other countries. Singapore also collects manufactured goods from industrialised countries and distributes them throughout the region. The chief items of trade, therefore, consist of (a) regional produce such as rubber, timber, palm oil and copra; (b) manufactured goods, including machinery and transport equipment; and also (c) petroleum and

petroleum products.

RUBBER is the most important commodity of trade. As only an insignificant amount of rubber is produced in Singapore, practically the whole amount is imported from neighbouring countries. West Malaysia is the main source of supply, with Sarawak, Sabah, Indonesia and other South-East Asian countries supplying the remainder. The rubber is exported to the U.S.A., the United Kingdom and other West European countries, Japan, the U.S.S.R. and China. Over 900,000 tons of rubber a year has been recently imported and re-exported. This was worth \$1,345 million.

PETROLEUM and petroleum products are among the most important items of trade and they rank a very close second to rubber. Singapore is a major world collecting and distributing centre for these products; it is also the main collecting and distributing centre in South-East Asia. This is because of Singapore's focal position and also on account of its excellent facilities for receiving, storing, blending and refining large volumes of these products. Besides these, Singapore also distributes and delivers large quantities of these products to all parts of South-East Asia. Singapore imports most of the petroleum and petroleum products from (a) Kuwait, (b) Sarawak (which obtains them from Brunei), and (c) Iran. Singapore exports them to South Vietnam, Thailand and West Malaysia and also to countries farther away, such as Hong Kong, Japan and Australia. The petroleum products are handled by five major oil companies, but Singapore workers benefit from the trade by the services they render.

TEXTILES form the third most important group of trade items. China is the main supplier of cotton textiles, followed closely by Japan and Hong Kong. Japan is by



A long-established industry in Singapore is that of battery making. In this picture, dry cells of a high quality are being checked and packed.

far the most important supplier of synthetic or man-made textiles. However, a large proportion of the imports is kept for local consumption, and only about 40% is re-exported, together with some locally manufactured cotton underwear. The exports are mostly sent to West Malaysia, Sarawak and Sabah.

RICE is another important trade commodity.

The making of soft drinks is another long established industry. In this picture the drinks are being bottled by a machine under the close scrutiny of a worker



Like textiles, only about 40% is re-exported, mainly to Malaysia. The chief suppliers of rice are Thailand, by far the leading supplier, China, Burma and Cambodia. Owing to the high price and shortage of rice supplies, the Government is encouraging the people to consume more wheat and less rice.

CANNED PINEAPPLES form the fifth most important trade item. Both imports and exports have recently increased, in spite of strong competition from South Africa and Australia. The United Kingdom and the U.S.A. buy most of the exports, with Canada and West Germany as the next most important customers.

COFFEE There has been a large increase of trade in non-roasted coffee beans, the main customers being the U.S.A., France, Malaysia, Italy and Belgium. Pepper of the black and white varieties, but especially black pepper, is imported from Sarawak, which is a major world pepper producer, and Indonesia. It is exported mostly to the U.S.A., the United Kingdom, Morocco and Japan.

Other important trade commodities are motor vehicles, palm oil, timber and copra. Copra is imported mostly from Malaysia, Sulawesi, Sumatra and Maluku. The main buyers of copra and coconut oil are Korea, India and Taiwan. Timber is imported mostly in the form of logs from West Malaysia. There are about a hundred sawmills which turn the logs into sawn timber. Most of the exported timber consists of light hardwoods and medium hardwoods. The principal buyers are South Africa, France and the U.S.A. Apart from textiles, motor vehicles form the most important group of manufactured goods among the entrepot trade items of Singapore. Most of the cars, lorries, trucks and buses are re-exported to Malaysia. But with the setting up of

car-assembly plants in West Malaysia, the export of vehicles would decline in volume.

Besides the commodities already mentioned, mostly entrepot trade items, Singapore imports many other commodities for its own internal consumption. The outstanding items are: fresh fish (mainly from West Malaysia), fresh vegetables and cigarettes.

Inter-governmental trade agreements have recently been concluded between Singapore and several East European countries, including the U.S.S.R., Poland, Rumania and Hungary. These agreements and several official trade missions will tend to increase the volume of the Republic's international trade.

Singapore's external trade has continued to expand. The total value of imports was \$4,397.9 million in 1967 and the total value of exports was \$3,491.6 million.

Industries

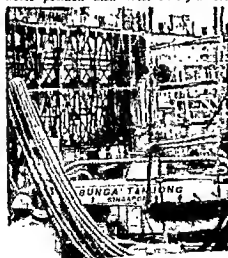
As a small country without resources such as iron-ore, coal, non-ferrous metals and other raw materials needed for large-scale industries, Singapore is in an even worse position than West Malaysia for

establishing and expanding industries. The main assets that Singapore enjoys are its position as a great port, which enables it to import the necessary raw materials, its versatile human resources and its Government's initiative and determination in large-scale planning and promotion of industries.

The Government has made great efforts to promote the establishment of new industries owing largely to the need to provide greater employment opportunities for its growing population. Its efforts have taken several forms, such as creating new industrial estates and providing them with all the facilities for setting up industries, giving financial assistance through loans and providing technical assistance and guidance to new industrialists. Incentives to attract new industries are provided in the form of relief from taxes for pioneer industries and the introduction of protective customs duties to enable local manufactures to compete with foreign goods on favourable terms.

Many secondary industries were established after World War II. They included heavy engineering, shipbuilding, ship-repairing, rubber-milling, the manufacture

These two pictures are striking examples of the achievements of Singapore in her efforts to industrialise. They show the repairing of ships at the Jurong Shipyard

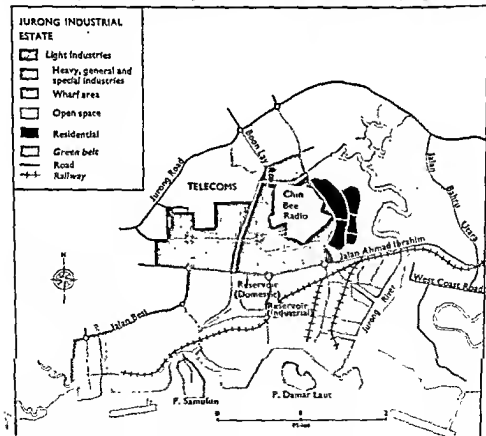


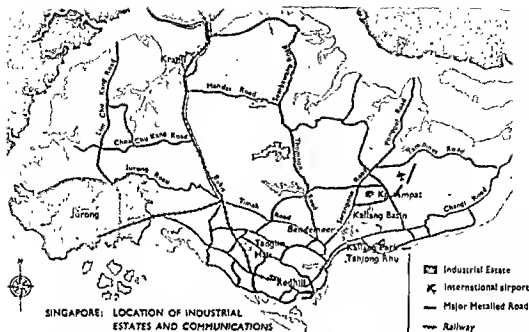
of paper products, brewing, pineapple canning, the making of soft drinks, biscuits, metal containers, bottles, batteries and other products. The main areas where these and other industries were set up are: (i) the Bukit Timah Road area; and (ii) the Alexandra Road area. Among these older industrial establishments are the refineries at Pulau Bukom and at Tanjong Berlayer opposite the western tip of Pulau Blakang Mati.

The present Government has, however, widened the base for industrialisation by developing the Jurong Industrial Estate and several other smaller new estates. The Jurong Industrial Estate in the south-west of the island will form part of a new industrial town covering 17,000 acres. It has provision

for a deep-water harbour with berths for the largest ships, a modern fishing port, large docks for repairing the largest oil tankers and other big ships, heavy industries and light industries. Roads, railways, water and electric power as well as housing, markets, schools and clinics are all being provided for a satellite town that will eventually have room for half a million people.

A large number of factories have already started operation at Jurong, including a new oil refinery and modern shipbuilding and ship-repairing yards. The Jurong shipyards include the largest civil dry dock south of Japan and east of Suez. There are also an iron and steel mill, cement factories, a tyre factory, timbering and wood pulp factories, chemical works, a grain silo, a





bicycle factory, and a large number of light industrial establishments where all sorts of articles from crown corks and socks to television sets and refrigerators are manufactured.

Over 230 new factories have been started or planned and these will employ more than 20,000 workers at full production stage. Besides Jurong, there are smaller industrial estates at Redhill, Tanglin Halt, Bendemeer, Kallang Basin and elsewhere. The Kallang Industrial Estate is designed mainly for the marine industries, such as boat-building.

The rate of industrial growth has been very rapid. There are now altogether more than a thousand industrial establishments in Singapore, including manufacturing, processing, servicing and repairing establishments. The total value of the overall industrial output of Singapore amounts to about \$1,500 million a year, and this value is increasing each year at a healthy rate. The great problem, however, is finding markets for some types of goods in very

competitive overseas markets, for instance, the market for textiles. The developed countries do not need most of the goods produced in Singapore, while many of the developing countries are trying to industrialise themselves.

Population

The population of Singapore is now over two million. With an area of 224.5 square miles, the Republic has a population density of 8,900 persons to the square mile. As is true of almost all other countries, the population is unevenly distributed. The most densely populated parts of the city have a density of 89,000 to the square mile. The rural areas, apart from the catchment area and nature reserves, have moderate densities. The remaining areas forming the intermediate zone are densely populated, with a density of 28,000 to the square mile.

The main built-up area, occupying some 30% of the total land area of the country

carries about 75% of the population. This area is in the southern part of the city, including the 'big town' district south of the Singapore river and the 'small town' district north and north-east of the river. This is the core or heart of the city, the oldest and most crowded part of the Republic, and also the business centre around which the commerce and trade of the Republic revolve.

Immediately to the north, west and east of the very densely populated area is a zone of lower population densities. The zone lies roughly within the 'city limits' and includes the built-up areas along the more important roads radiating fan-wise from the heart of the city, for example Orchard Road, Thomson Road, Serangoon Road and Geylang Road.

In the remaining areas of the Republic the population is moderately dense, with patches of minor population concentration and other patches of sparse population. The Southern Islands and other islands of the Republic are, except for Pulau Bukum, sparsely populated.

Of the population of over two million, about 75% are Chinese, about 15% are Malays and the remainder, about 10% consists of Indians, Pakistanis and others.

Transport

Road Transport

There are about 525 miles of metalled roads maintained by the Government in the city and rural areas, and about 300 miles of private roads, minor roads and kampong roads which are not properly surfaced. The main roads branch out fan-wise from the heart of the city in the south of Singapore Island. The chief arterial road is Bukit Timah—Woodlands Road which leads from the heart of the city northwards to the

Causeway in the north of the island. It carries much passenger and freight traffic between Singapore and West Malaysia.

Rail Transport

The railway running from the Keppel Harbour area in the south to Johore Bahru in West Malaysia is part of the Malayan Railway system, which is owned by the Government of Malaysia. The railway station in Singapore is near Keppel Harbour, where a branch line connects the main line with the harbour and dock area. Another branch line links the main line with the Jurong Industrial Estate, inside which there are 12 miles of new railway tracks serving the various parts of the Estate.

Air Transport

Apart from the military airports on the island, for example, Changi and Tengah, Singapore has an international airport at Paya Lebar, in the eastern part of the island. This is one of the most important airports in South-East Asia. It has a runway of 9,000 feet, which is being extended to 11,000 feet so that the airport can serve the largest and newest jet planes used for non-military purposes. The Singapore International Airport now serves over twenty international airlines, which operate frequent services to almost all the developed countries of the world.

Sea Transport

To a large extent Singapore's economy is dependent on its trade. Situated at the cross-roads of South-East Asia, Singapore serves as a hub of expanding activities in this region. In 1966, the total tonnage of ships handled by the port aggregated 103.1 million tons. In the same year a record total tonnage of 26.64 million tons of cargo were handled

by the port.

Bulky cargoes like rubber and tin are undertaken cheaply by sea transport. With the setting up of industries, especially at Jurong, sea transport will become of greater importance for the transport of raw materials

into and manufactured goods out of Singapore. With the expansion of port facilities and the continued prosperity of the country sea transport will, no doubt, play an ever-increasing role.

EXERCISES

1. Write an essay on the distribution of people and the pattern of communications either of Singapore Island or of Kelantan. Illustrate your essay by a sketch-map.
2. Choose one of the ports: Singapore, Penang, Port Swettenham or Malacca. Draw a large-scale map to show details of its site and harbour, and a second small-scale sketch-map to show the main features of its trade. (Only the two sketch-maps are required in answering this question.)
3. Describe and account for the entrepot trade of Singapore.
4. (i) Draw two simple sketch-maps of either Kuala Lumpur or Singapore, one to show its site, and the second to show its general position in Malaysia.
(ii) Describe and explain the rapid growth of the city you have chosen.
5. Describe the Industries of Singapore. What are the advantages and disadvantages, if any, of Singapore as an industrial centre?

Chapter 12

Indonesia: Java

The Republic of Indonesia lies astride the equator and stretches longitudinally from 95°E to 142°E. Thus from east to west, Indonesia extends for almost 3,000 miles and from north to south over 1,250 miles. In terms of size, Indonesia is the largest insular territory of the world and although four-fifths of its area is covered by sea, its total land area of 736,000 square miles is still large enough to make the Republic of Indonesia the tenth largest political territory in the world today.

The Indonesian islands extend over both the Sunda and Sahul shelves. The seas within have been the main venue of inter-island communication. Yet, the insular nature of the country explains for much of the isolation suffered by the remoter islands. Indeed, the outer limits of the Archipelago are separated by over 2,500 miles of seas.

There are over 3,000 islands in Indonesia.

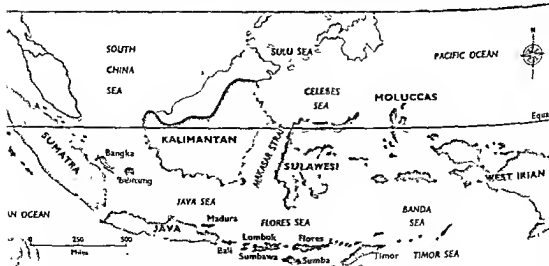
They vary in size and population densities. For convenience, these islands can be classified into four groups:

1. *Greater Sundas* comprising the islands of Java, Sumatra, Borneo and Celebes;
2. *Lesser Sundas* which extends from Bali to Timor;
3. Moluccas islands and
4. West Irian.

Of these islands, Java is by far the most important economically and the most densely populated.

JAVA

Java (51,039 square miles) is the heart of Indonesia although it is the smallest of the main islands of the Republic. It is the most important island, not only in terms of population, but also in terms of political, economic and cultural development.





DISTRICTS OF JAVA

Although it has one-fifteenth of the total land area of Indonesia, its population forms more than 65% of the total population of the Republic.

Historically, Java was the main scene of Dutch activity, both in the political and economic fields. The Dutch made strenuous attempts to turn the island into one vast plantation for the production of export commodities such as coffee and sugar. The system of agriculture established is known as the 'Culture System', which resulted not only in much economic development but also in a great increase of population. Since then, the long use of Western methods and techniques of cultivation, the addition of commercial to subsistence agriculture, and the major irrigation and drainage schemes carried out by the Dutch, have all helped to establish a varied agriculture in Java.

There are also several geographical factors which account for the greater development and higher population densities in Java. In the first place, it is the geographical position of Java. The island is close to the Sunda Strait and the Strait of Malacca, both important as route-ways for maritime traffic, so that Java has been within easy reach of the major streams of trade and human migration.

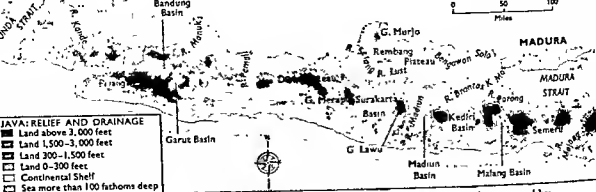
Secondly, the slender shape of the island, as compared with the much more compact

shapes of Borneo and Sumatra, has enabled easier penetration and access into the inland parts of Java. Java is some 620 miles in length and about 120 miles at its greatest width, but it narrows to 50-60 miles in its central portion or 'waist'.

Thirdly, the island's relief features are such that there is no compact or continuous mountain barrier. The central belt of mountains is broken by gaps at several points, which allow easy movement across the width of the island from north to south.

Another factor is that the soils of Java are noted for their great fertility, except in a relatively few small areas. This is due to the large number of volcanoes, whose ash and lava have been weathered down to form rich soils which have been transported far and wide to add to the fertility in many parts of the island. The volcanic material are mostly neutral-basic, and not acidic in character. Such material weather into good soils. It is the great fertility of the soils in Java that has made possible the intensive cultivation of wet padi and other crops. It is mainly the intensive cultivation of wet padi over large areas that has enabled the island to support a very large population.

The warm climate with adequate but not excessive rainfall and the opportunities for irrigation are other factors favourable to agricultural development. Apart from the



western section of Java, there is no undue leaching of the soil by excessive equatorial rains.

Major Physical Divisions

Java may be divided into three main physical divisions in the form of three longitudinal or east-west belts. They are by no means continuous belts, but are broad structural and relief divisions within which certain variations of relief may be found.

1. THE SOUTHERN BELT OF PLATEAUS AND HILLS

The southern belt along the shores facing the Indian Ocean consists of limestone plateaus and hills. The belt is not continuous, for it includes five separate limestone plateaus, two of which are extensive plateaus with massive limestone formations. The plateaus often rise steeply from the coast and reach a maximum height of 2,400 feet. Between the limestone plateaus are other sedimentary uplands in the form of hills and ridges which often come to the coast as cliffs, especially in West Java. The belt of plateaus and hills is also interrupted by alluvial lowlands which are generally narrow and patchy, except in Central Java where the alluvial Banjumas (Banyumas) and Keda plains are fairly extensive.

The limestone plateaus present a *karst* landscape with porous rocks and underground drainage, waterless and barren

surfaces, bare hills and depressions caused by the collapse of underground caverns. These karst features are more typical of the plateaus in the drier east, for the plateaus to the west receive more regular rainfall and the arid karst features are less pronounced. The limestone plateaus in the southern belt are, in general, less developed and less densely populated than most other parts of Java.

2. THE CENTRAL BELT OF MOUNTAINS AND BASINS

The central belt of Java is the most prominent of the three major physical divisions. It forms the lofty mountainous backbone of the island, but is not a continuous belt and reveals various structural elements and relief features. The region consists of a broad and high structural base of folded sedimentary strata of sandstones, shales, breccia and other rocks. Lines of weakness which developed in this sedimentary sub-structure tend to form a longitudinal trough between the folded uplands. At points along these lines of weakness, molten rock and lava were forced up from beneath the earth's crust and great volcanoes were thus superimposed or surmounted on the structural base of sedimentary uplands. Eruptions caused volcanic materials to spread far and wide, covering many of the original features, including parts of the longitudinal trough.

Java is one of the most active volcanic regions in the world. There are some 120

volcanoes on the island, of which 14 rise above 10,000 feet. Several of these high volcanic mountains stand on the 6,500-foot Dieng Plateau in Central Java, but the highest mountain is Gunung Semeru in East Java, which is 12,060 feet high. Among the seventeen active volcanoes, Gunung Merapi in Central Java is the most active.

The volcanic mountains in West Java form huge mountain masses consisting of collections of volcanoes grouped round or enclosing intermontane basins and high plains. Good examples of such basins are the Bandung Basin and the Garut Basin to the south-east of Bandung. These basins were formerly lakes and though still marshy at places and contain small lakes, have fertile volcanic alluvial soils where intensive agriculture has developed.

In Central Java and East Java, the volcanoes are not massed together as in West Java, but form small groups of twos or threes. The groups are well spaced out, with high plains, intermontane basins or river valleys separating them. The main basins between the volcanoes are the Surakarta Basin, the Madiun Basin, the Kediri Basin and the Malang Basin.

The Surakarta Basin is part of the Solo valley and lies between the volcanoes Merapi and Lawu. This is a broad and low basin, and

slopes are terraced for the cultivation of rice and sugar. The fertility of the soils is renewed by volcanic ash from Gunung Merapi.

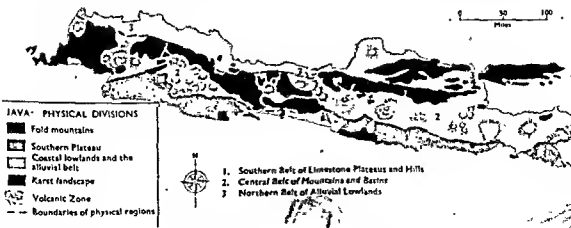
The Madiun Basin east of Gunung Lawu is drained by the Madiun river, a tributary of the Solo. It is a relatively narrow and flat basin. Rice terraces here reach 3,000 feet up the sides of the basin.

The Kediri Basin farther east, where the town of Kediri stands, is drained by the Brantas river. This is a broad and relatively low valley which stretches far south and broadens out to the north and north-east.

The Malang Basin is a high plain situated about 1,200 feet above sea level. It may have been a lake in former times.

3. THE NORTHERN BELT OF ALLUVIAL LOWLANDS

The northern belt consists mainly of a fairly broad alluvial plain sloping from the volcanic mountains of the central belt towards the Java Sea in the north. The alluvium is very fertile, being formed of basic volcanic material transported by rivers to the plain. There is often a break of slope between the inner and slightly higher part of the alluvial plain and the outer and lower alluvials along the coast. The inner zone is clear of swamps and is between 50 and 300 feet in elevation. Roads and railways



which run along the Northern Belt are located in the inner and higher zone. The northern belt of alluvial lowlands is drained by the more important rivers of the island. The rivers have built a series of deltas at their mouths. Among these rivers, the longest are the Solo and the Brantas. The river Solo or Bengawan Solo rises on the highlands well to the south and in its upper course flows through the fertile Surakarta Basin. In its lower course, it meanders through swamps and lakes and reaches the sea north of Surabaya. The Brantas rises on the highest mountain in Java, Gunung Semeru, and takes first a westerly course, then turns north, flows through the Kediri Basin and then turns eastwards towards the Madura Strait. At its mouth, it divides into two branches, one of which is the Kali Mas, on which Surabaya stands.

The northern belt of alluvial lowlands is broadest in West Java, but becomes

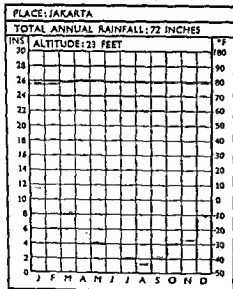
narrower east of Pekalongan. In East Java, the lowlands are interrupted by the large volcano to the west of Rembang and by a limestone plateau to the south and south-east of Rembang. South of the Rembang Plateau, the lowlands consist of the broad valleys of the Bengawan Solo and the Brantas, occupied largely by padi and sugar but north of the Rembang Plateau, the coastal lowland is very narrow.

The Rembang Plateau resembles the limestone plateaus in the southern belt. It lies in the drier eastern part of the island and its soils are not only among the least fertile in East Java but also cannot be irrigated. Its chief resource lies in its teak forests. The limestone region is continued eastwards across the Madura Strait into the island of Madura. Madura is administered together with East Java. Its infertile soils are cultivated with maize and there is large-scale rearing of cattle.

Climate

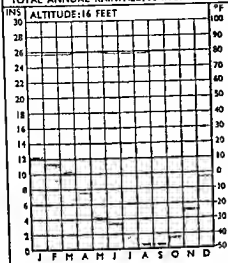
As Java lies between 6°S and 9°S latitude, it is near the equator and its mean annual temperature is about 80°F. The mean annual temperature at Jakarta is 79°F and that at Surabaya is 80°F, but temperatures are of course modified by altitude. Bandung, which is situated at an altitude of 2,360 feet, has a mean annual temperature of 72°F.

Java is situated in the southern hemisphere not far from the equator. The winds which blow towards the equator from the north-east or north are deflected to the left when they cross the equator, thus reaching Java as north-westerly or westerly winds. The season in which such winds blow is known in Indonesia as the West Monsoon. This is the wet season which lasts from November to March in Java. Rainfall during the West Monsoon is heavy in most parts of Java.



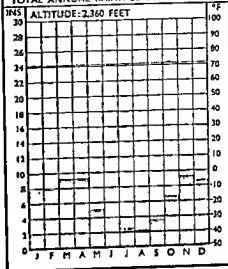
PLACE: SURABAYA

TOTAL ANNUAL RAINFALL: 68 INCHES



PLACE: BANDUNG

TOTAL ANNUAL RAINFALL 74 INCHES

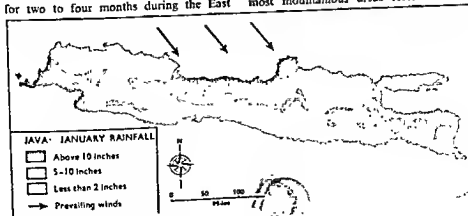


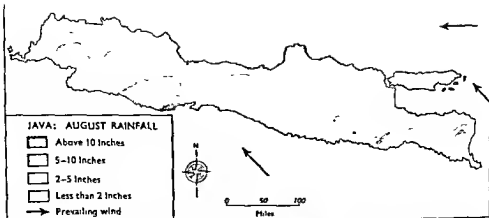
The conical shapes of the volcanoes and the absence of long continuous ranges result in few areas experiencing real rainshadow effects during this season. The north-central parts and other highland areas receive particularly heavy rainfall.

From May to October, the South-East or Easterly winds blow as the East Monsoon which brings little rain, especially to the eastern half of the island. Most areas in the eastern half and the northern parts of the island receive less than 2½ inches a month for two to four months during the East

Monsoon. In the high mountainous areas in the western half of Java, there is moderate rainfall during this 'dry season', especially on the southern side of the highlands.

Except in the eastern third of the island, most parts of Java receive an annual rainfall which ranges from heavy to very heavy. The annual rainfall of places in lowlands and in sheltered highland locations is heavy, for example Jakarta, 72 inches; Semarang, 85 inches; and Bandung, in a sheltered upland position, 74 inches. But most mountainous areas receive a total





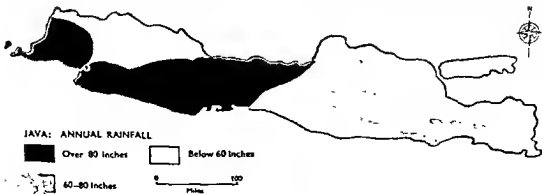
annual rainfall of 160 inches or more. For instance, a station on the northern slope of a mountain range to the south-east of Pekalongan records a mean annual total of 270 inches. On the other hand, Surabaya and Pasuruan in the drier eastern part of the island receive 68 and 51 inches respectively. Asembagus, at the foot of Gunung Ijen at the eastern end of the island, receives only 36 inches a year.

In West Java, the annual rainfall is more evenly distributed throughout the year than in East or Central Java. Only in one or two months is the rainfall less than $2\frac{1}{2}$ inches. The number of such dry months increases eastwards, until in East Java there are four or five very dry months. The climate of Central and East Java, with its more pronounced dry season, provides more variety of climatic conditions for agriculture and is more suited to grain crops than is the true equatorial type of climate without any pronounced dry season.

Agriculture

The island of Java occupies only 7% of the total area of the Republic of Indonesia. It is, however, inhabited by about 65% of Indonesia's total population. One explanation for this irregularity lies in the fact that agriculture in Java has been so developed that the total cultivated area on the island forms nearly 65% of the total cultivated area in the whole of Indonesia. It is the highly intensive and widespread agricultural development of Java that has enabled the island to support such a teeming population.

Of all the Indonesian territories, Java has the most varied agriculture. The factors responsible for this are partly historical and partly geographical. Historically, Dutch policy and techniques have been to a certain extent responsible for the intensity and variety of Javanese agriculture. But the underlying factors are geographical, namely, the great fertility of the soils on the island and the climatic conditions which create



a variety of environs suitable for the cultivation of different crops.

The fertility of the soils is due largely to the basic nature of the volcanic material from which the soils have been derived and the widespread occurrence of such enriching material.

The warm climate with adequate but not excessive rainfall and the variety of climatic conditions which enable various types of wet and dry crops to be cultivated have also contributed to the intensive and varied agricultural practices. Another climatic factor is the occurrence of a relatively dry season each year in many parts of Java and a distinctly dry season in the eastern parts, with the result that little severe leaching of the soil by excessive equatorial rains has taken place in these areas.

SUBSISTENCE AND COMMERCIAL AGRICULTURE

Unlike Sumatra, Kalimantan and other parts of Indonesia, shifting agriculture in Java is of very little significance. Sedentary agriculture of both the subsistence and commercial type is the prevailing form of agriculture. The subsistence type is very intensive, while the large-scale cultivation of cash or commercial crops is also very important, especially as much of it takes place in areas unsuitable for the intensive cultivation of subsistence crops. Besides, many food crops are grown partly as cash crops. This combination of subsistence and commercial crops and the maximum utilisation of usable land, have made Javanese agriculture one of the most outstanding examples of a prosperous mixed agriculture.

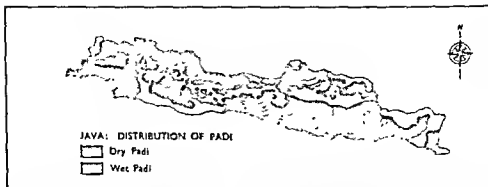
Although the large-scale cultivation of plantation crops is better developed in Java than in the Outer Territories, the acreage under plantation crops is actually less than 7% of the total cultivated area on the island.

The plantation crops occupy only about 1.5 million acres out of a total cultivated area of some 22 million acres. Most of the remaining 20.5 million acres of cultivated land is devoted to the growing of food crops to feed the large population. There is little suitable land left for expanding the acreage under food crops to meet the needs of the growing population. The Government has therefore organised and encouraged the emigration of people from Java to the Outer Territories. It has also made efforts to increase food production by providing better irrigation and drainage facilities and teaching better farming techniques to the farmers.

Food Crops

PADI is the dominant crop in Java in terms of acreage and total yields. More than 10 million acres of land are under wet padi and it is largely by the intensive cultivation of wet padi that the vast population of Java can be supported. Acre for acre, padi provides higher yields than other grain crops. Wet padi is grown in practically the whole northern belt of alluvial lowlands, except in the less fertile Rembang limestone plateau area. It is also grown in the intermontane basins, plains and valleys within the central belt where it is cultivated even on terraced hillsides and slopes of volcanic mountains up to great heights. Dry padi, grown mostly in the uplands and non-irrigable lands in the Districts of Banten (Bantam), South Bogor and Jogjakarta, occupies only about one-fifth of the total padi acreage. It is less productive than wet padi, its yields being only two-thirds those of the wet type.

Much wet padi is double cropped, especially in the drier but irrigated areas in Central and East Java, such as the plains of Demak and Malang. The second padi crop each year is produced during the dry



season with the use of irrigation water.

MAIZE is the second most important food crop. It requires more sunshine and a drier climate than padi, and its cultivation is important in the sunnier and drier parts of Central Java and especially of East Java and the island of Madura. It is grown mostly by smallholders in non-irrigated fields and in the higher areas. The chief maize-growing areas are along the north-east coast and in the eastern intermontane basins. While largely consumed locally, maize is also exported to other Indonesian islands. On the island of Madura, where the climate is relatively dry and the soils rather infertile, maize is the chief food crop and forms the staple diet of the Madurese people.

OTHER FOOD CROPS Other secondary food crops include tapioca, soya beans, groundnuts and sweet potatoes. Tapioca is grown on a considerable scale. Some three million acres of land are devoted to its cultivation and its total production is over seven million tons a year, as compared with two million tons of maize and four million tons of padi. Tapioca is grown mostly in the drier and higher areas, especially in East Java and Central Java. Like maize, it is grown partly for export to foreign manufacturers of industrial alcohol, glues and starch. The

cultivation of soya beans and groundnuts has been increasing in importance. The total acreage under soya beans is 1.3 million. Groundnuts occupy a smaller area of 0.7 million acres. Both soya beans and groundnuts are grown partly as subsistence crops and partly as cash crops.

In Central Java, the growing of secondary crops is more important than in West Java, but in East Java the cultivation of maize, tapioca, soya beans, groundnuts and sweet potatoes is even more extensive than in the central and western regions.

Cash Crops

The main cash crops are rubber, sugarcane, tea, coffee and tobacco. The less important cash crops are coconuts, kapok, oil-palm, sisal and cinchona. These plantation crops occupy only about 1.5 million acres of land, but their total export value represents a large proportion of the total value of all exports from Java. Rubber, tea and coffee are mainly high altitude crops and their cultivation is concentrated in the wet highland areas of West Java and East Java where the volcanic soils and adequate rainfall suit their large-scale cultivation.

RUBBER In Java, rubber is grown mainly as a plantation crop, unlike the situation

in Sumatra and Kalimantan, where it is cultivated mostly in smallholdings. Among the plantation crops in Java, rubber occupies the largest acreage, about 40% of the 1.5 million acres. The rubber plantations are located mostly in the wet upland areas around 1,500 feet in the Preanger Highlands. The Preanger Highlands is a term used for the mass of volcanic highlands in the Districts of Bogor and Priangan. In the westernmost district of Banten (Bantam) as well as in the Preanger Highlands, rubber is grown in a belt almost surrounding the tea, coffee and cinchona plantations. In this belt, rubber occupies the slopes lower than the tea, coffee and cinchona plantations. In East Java, too, rubber is grown mostly on the lower volcanic mountain slopes in the districts of Malang and Besuki (the two easternmost Districts). Often the rubber is grown on the wetter southern slopes of the mountains.

SUGAR-CANE is another important cash crop. It is grown in plantations as well as in smallholdings. The sugar-cane plantations are really large padi fields where sugar-cane is grown in rotation with wet padi. This is different from the sugar-cane plantation system in such countries as Queensland and the West Indies, where sugar-cane occupies land devoted entirely to the crop. Sugar-cane requires a dry season to enable the cane to ripen properly and preserve the sweetness of the cane. The crop is therefore grown in many parts of East and Central Java, where the East Monsoon season is a relatively dry one. It is cultivated in the lowland areas, where the best soils are reserved for sugar-cane.

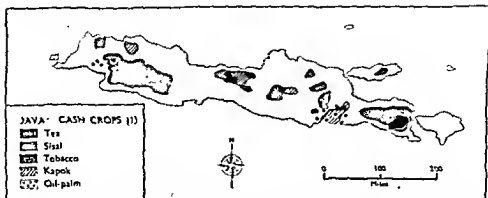
The most important sugar-cane areas are in East Java, in the districts of Surabaya, Madiun, Malang and Besuki. From the town of Madiun to Situbondo in the east,



Intensive padi farming on terraced slopes in Java.

there is an almost continuous stretch of sugar-cane plantations and smallholdings, which are located mainly in the lowlands to the north of the eastern volcanoes. In this region, there is a dry season of about five months. Here the growing of sugar-cane and the production of sugar are more important than elsewhere in Java.

The next important area lies in the districts of Jogkarta and Surakarta, where sugar-cane are grown on the fertile plains between the volcanic mountains and the southern limestone plateau region. The third important sugar-cane growing area lies in the northern



lowlands of Central Java, especially around Tegal and Pekalongan. The dry season here from June to September and the careful irrigation enable the crop to be grown on a large scale.

Before World War II Java was a major exporter of sugar, but after the war, the production declined. Since the crop occupies land that also suits wet padi, the acreage decreases when sugar prices are low and when more land is needed for food production. However, the production of sugar has recently increased to some extent. TEA is a high altitude crop grown mostly in plantations. Its total acreage is about 20% of the total acreage under plantation crops. The tea plantations are mostly located on the cool, rainy Preanger Highlands in West Java. The main areas are around Sukabumi, Pengalengan, Garut and Sabang in the Districts of Bogor and Priangan. The plantations occupy the well-drained slopes of volcanic mountains, and in some places the crop is cultivated on very steep but terraced slopes. It occupies higher locations than rubber and coffee, usually between 2,500 and 4,500 feet. The Preanger Highlands region is one of the world's leading tea-producing areas.

COFFEE. This crop occupies about 17% of the total acreage under plantation crops. Its cultivation is concentrated in East Java, where the Districts of Kediri, Malang and Besuki form the chief coffee-producing region in Java. Within this region, the most important area stretches from Gunung Kelud (near Kediri) to Gunung Ijen (at the eastern end of the island). The coffee plantations and smallholdings in the Preanger Highlands and elsewhere on the island are subsidiary coffee-producing areas.

TOBACCO is another important cash crop grown mainly for the manufacture of cigarettes. Similar to sugar-cane and maize, tobacco requires a dry season, so that its cultivation takes place mainly in the drier central and eastern parts of the island. The most important areas are in the Districts of Jogjakarta, Surakarta and North Kedu. In the North Kedu area, the crop is grown on the Dieng Plateau and centred at Wonosobo (to the north-east of Magelang). In East Java, it is grown in the District of Besuki where its cultivation is centred at Jember and Bondowoso. Tobacco is an important crop on Madura, too. There are some 700 factories which manufacture spiced cigarettes locally called *rokok kretek* and

other types of cigarettes.

OTHER CROPS The coconut palm is planted along many coastal stretches, especially in the districts of South Kedu and South Banyumas and around Banyuwangi at the eastern end of the island. Kapok, a silky fibre from the kapok plant, is a crop of which Indonesia is a leading world producer. It is grown in the northern part of Central Java and in the districts of Kediri and Malang in East Java. Other crops such as sisal, oil-palm and cinchona are mainly plantation crops grown on the Preanger Highlands. Sisal is also cultivated at Gunung Kelud near Kediri and in the Malang area in East Java.

LIVESTOCK REARING

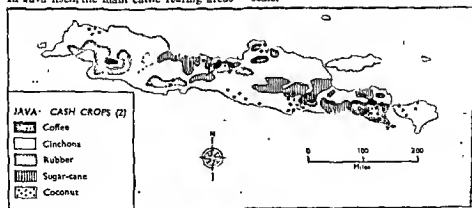
The rearing of livestock is a relatively minor agricultural occupation in Java, especially for the purpose of food production. The island of Madura is the major cattle rearing area. Several million cattle are reared in Java and Madura. In Madura, cattle are reared mainly for export. Large numbers of cattle are sold each year, both for meat and for use as beasts of burden. In Java itself, the main cattle rearing areas

are around Pasuruan in East Java and near Bandung in West Java, where large herds are kept partly to produce milk for the townsfolk in the Bandung and Jakarta areas.

Industries

Of all the territories in Indonesia, Java is the most highly industrialised. About 85% of the industrial establishments in the whole of Indonesia are located in Java, as the secondary industries in the Outer Islands are not well developed. Yet Java itself cannot be considered very advanced in its industrial development, especially in heavy industries, as compared with other Asian countries like Japan, China and India.

As Java does not have adequate resources in power and metal ores, especially iron-ore, it is not in a favourable position to develop large-scale heavy industries. Indonesia's reserves of coal are not extensive and there is lack of coking coal needed for smelting iron. Resources in power, both thermal and hydro-electric, are not well developed in Java. Without the resources to develop industries, no proper foundation could be laid for developing modern industries on an extensive scale.



The main industries at present are the processing ones, as in West Malaysia. The chief processing industries in Java are sugar refining, oil refining, rubber milling and tea processing. There are some 55 sugar mills, more than 30 of which are in East Java, the chief sugar-producing region, and most of the remaining ones in Central Java and only a few in West Java. Jogjakarta in Central Java has the largest sugar-refining factory on the island. Mineral oil refining takes place in Wonokromo which is situated south of Surabaya, and the processing of tea takes place in the tea plantations.

In manufacturing, there has been some degree of industrialisation, especially in the light industries. But the manufacture of most industrial products, including consumer goods, is carried out on a scale that is small in relation to the large population of the chief cities. The textiles and clothing industry is important in all the large towns: Jakarta, Surabaya, Semarang, Jogjakarta, Surakarta, Cirebon, Pekalongan and Bandung. There are also spinning and knitting factories in various other parts of the island. The batik industry is concentrated in Pekalongan, Jogjakarta, Surakarta and Jakarta. Rubber goods are manufactured in Bandung, Surabaya and Bogor. Ship-building takes place in Jakarta, Surabaya and Semarang, while small coastal vessels are also built in Jepara. Paper is manufactured in Malang in East Java.

Other light industries, mostly concentrated in and around the large towns, include the making of cigarettes, soap, matches, umbrellas and other goods. There are some 700 tobacco factories which produce 270 million cigarettes a year. There are altogether about 8,500 industrial establishments in Java, mostly small ones. The largest of them belong to these industrial groups: textiles,

foodstuffs, chemicals, tobacco, transport equipment including shipbuilding and the assembly of cars, rubber and printing.

The Government's efforts to industrialise the country have resulted in considerable expansion of small-scale industries operating in homes and small workshops mainly in the rural areas. Central workshops have also been set up to serve the local co-operatives in different areas. Among the small-scale industries which have been promoted are pottery, tanneries, umbrella works, and workshops or small factories producing iron and copper ware, tiles, furniture and cardboard.

The Government's efforts to promote large-scale industries have not met with great success. Of the many large projects planned, only some have been completed. They include printing works at Jakarta, Surabaya and Semarang, a gunny-bag factory at Surakarta, a cement factory at Gresik near Surabaya, a spinning factory at Chilachap, a paper mill at Malang, a caustic-soda plant and a nail factory at Waru in East Java. Most of the large modern factories are located in Central and East Java. These are the areas that have a large population. Industries provide jobs for many people. Thus, they help to relieve the unemployment problems.

However, owing to the unstable political conditions and the anti-foreign policy of the Government, many large factories are working up to only 10 to 30% of their full capacity. Many others have stopped production or closed down. Many new industrial projects have remained uncompleted.

Apart from political factors, there has been relatively little development of industries in recent years owing to the lack of capital, the shortage of skilled and

efficient workers and the lack of technological experts.

The Mining Industries

The mining industries in Java are also relatively unimportant, as there are no large deposits of the major minerals. A little petroleum is produced near Rembang and at the delta of the Brantas near Surabaya. Manganese is worked at Kliripan to the west of Jogjakarta and at Karang Nnnggal near Tasik Malaja in West Java. It is exported through Chilachap. There are a number of sulphur deposits in the volcanic crater lakes at Kawah Putih and Telaga Bodas in West Java and in the Dieng Plateau in Central Java. Salt is processed on Madura island, while the coastal deposits near Chilachap are likely to yield iron-ore.

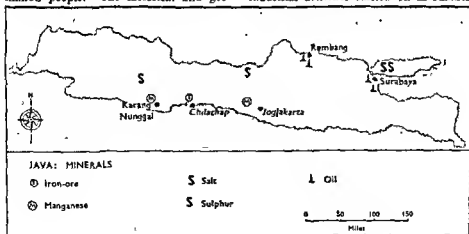
Population

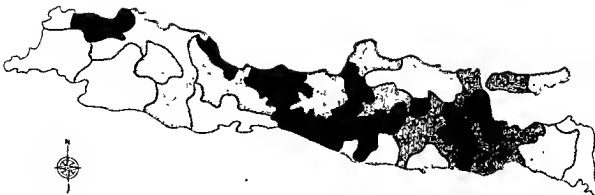
Java and Madura taken together occupy only some 7% or one-fifteenth of the total land area of Indonesia but have about 65% of the total Indonesian population of 110 million people. The historical and geo-

graphical factors mentioned in an earlier chapter largely account for the great concentration of population on the island of Java. The geographical factors include the great fertility of the soils, the fairly extensive irrigable lowlands, the widespread use of irrigation facilities and the favourable climate which suits the intensive cultivation of padi and the growing of cash crops.

The average density of population for the island as a whole is very high, being about 1,400 persons per square mile. As the population is steadily increasing at the rate of 2.3% a year, the density of population, too, increases with it. The population is mainly rural, and this means that its rural densities are among the highest in the world. The very densely populated areas are:

(a) Parts of the northern belt of alluvial lowlands, especially the areas around Jakarta, Chirebon, Tegal, Pekalongan, Semarang and Surabaya. The dense population in these areas is connected with the intensive cultivation of wet padi, the growing of sugar, and also the commercial and industrial activities carried on in Jakarta,





JAVA: POPULATION DISTRIBUTION

Over 1,500 people per sq. mile.

1200-1500 people per sq. mile.

900-1200 people per sq. mile.

600-900 people per sq. mile.

300-600 people per sq. mile.

0-300 people per sq. mile.

Surabaya and the other towns.

(b) The Jogjakarta and Surakarta areas, again associated with the intensive cultivation of padi and sugar and of secondary food crops such as maize, tapioca, yams, soya beans and groundnuts.

2. The areas which are densely populated are:

(a) The greater part of the 'waist' of Java, stretching from the areas around Pekalongan and Semarang along the north coast to the Banjumas and Kedu Plains in the south.

(b) The intra-volcanic basins in East Java, namely the Madiun Basin, the Kediri Basin and the Malang Basin. In these areas, the agricultural population is so high that settlements are found up the slopes of volcanic mountains, to take advantage of the newer ash deposits for the cultivation of crops.

(c) The island of Madura has an average population density even higher than that of Java. Apart from the thinly populated longitudinal trough in the limestone plateau,

the island of Madura is densely peopled by farmers who grow maize, rice and tobacco and raise livestock. There is such overcrowding that many Madurese have been migrating to Java.

3. The rest of the island of Java has a *moderately dense population* except for a fairly large area in the extreme south-west. The soils in the south-western part of the island are relatively infertile, as they are derived mainly from acidic volcanic material and not from the neutral-basic volcanic material commonly found in other parts of Java. But even in this area, the density of population is not really low as it is 150-300 per square mile. Elsewhere, there are small areas of low population densities on the upper parts of the highest mountains and around acidic volcanoes.

The density of population varies largely according to the form of agriculture practised. In the Bandung and Garut Basins, for example, the plantation form of agriculture does not support population densities as high

as in areas where the intensive cultivation of padi with double cropping is possible. The areas where rubber, tea and coffee are planted on a large scale have only moderate densities. Areas where the soils are derived from limestone, such as those in the south of West Java, can support only fair to moderate densities of population. Again there are mountainous areas with convex instead of concave volcanic slopes and these areas cannot be easily terraced. Where mountainous areas lack volcanic soils, they do not attract farmers and remain rather sparsely inhabited.

Thus the chief factors which contribute to high population densities are low relief or terrain that is not too rugged, soil fertility, irrigation facilities and climatic conditions which suit the growing of food and cash crops. The distribution of population in Java is closely related to these geographical factors, as well as to the historical factors such as the effects of the Dutch Culture System.

Chief Towns

JAKARTA

Jakarta (pop. 3,500,000), the capital of Indonesia, is situated near the mouth of the Chi Liwung River. It is the chief business and industrial centre as well as the centre of administration for the whole of Indonesia.

Jakarta was the creation of the Dutch. It was the first foothold established on the island by the Dutch. Its growth was partly due to Dutch policy and activity, and partly due to geographical factors. Geographically, Jakarta is well situated in the north-west of Java close to the main trade routes passing through the Strait of Malacca and the Sunda Strait. It was also the natural outlet for the products of the alluvial lowlands

in the north of West Java. When the Dutch developed plantation agriculture in the Preanger Highlands of West Java, Jakarta became the chief outlet for the important export crops cultivated in the lowlands and highlands of West Java.

Jakarta is still the main outlet for the tea, rubber, copra, tobacco, sugar, palm oil and other products of both West and Central Java. As a river port, its anchorage is now badly silted, but its port functions are carried on through its outport at Tanjung Priok about six miles to the east. Tanjung Priok is well connected with Jakarta by road, rail and canal and has an artificial harbour which is one of the best equipped in Asia.

Besides serving as the main commercial centre for West and Central Java, Jakarta is the collecting centre for the exports of copra and timber from Kalimantan and other Indonesian territories. It is an important focus and terminus of the rail, road and air routes of the island. But as an international centre of air-routes in South-East Asia, Jakarta lies too far south and is not able to rival Singapore or even Bangkok in this role.

As an industrial centre, Jakarta has a wide range of industries, including rubber-milling, the extraction of coconut oil and the processing of other agricultural products. There are many light industries, such as textiles, including the making of batik material, the assembly of cars and bicycles, the manufacture of consumer goods such as soap, footwear, cigarettes, paints, and varnish, as well as engineering industries such as shipbuilding, ship-repairing and locomotive works.

SURABAYA

Surabaya (pop. 1,350,000) is situated on the Kali Mas or Kali Brantas, one of the

two main distributaries of the Brantas River. It is the second most important city and port in Indonesia. It has a large commercial harbour protected by a breakwater and sheltered by the island of Madura. The port is the eastern terminus of the large ocean-going ships plying between Europe and Indonesia. Surabaya is also the chief naval base of the country.

The port handles a large external trade, especially the exports of sugar, rubber, tobacco, coffee, kapok and other products of East Java and also parts of Central Java.

Surabaya has important secondary industries, including oil refining, sugar refining, textiles, shipbuilding and ship-repairing, locomotive workshops, and the manufacture of machinery, electric bulbs, chemicals, cigarettes and margarine. Its smaller industries include the manufacture of soap, beverages, glass, umbrellas and rubber goods.

SEMARANG

Semarang, (\$50,000), is the chief port of Central Java, but its trade consists mostly of coastal traffic. The products of its hinterland intended for foreign markets are mostly shipped by way of Jakarta or Surabaya. Its hinterland is thus shared with both these two larger ports.

The chief exports of Semarang are teak, sugar, tobacco, copra, kapok and tobacco. These are typical products of the drier central region of Java. Small ships carry these products from the coastal harbour of Semarang to Jakarta and Surabaya for transshipment. The main industries in Semarang include textiles, coconut oil and cigarettes, and also the building of small vessels.

BANDUNG

Bandung (1,100,000) is an important inland

town situated about 2,500 feet on a high plain surrounded by volcanoes. It is a commercial centre serving the plantations on the Preanger Highlands. But Bandung has acquired important industrial functions, and among its industries are textiles, the manufacture of rubber goods, the manufacture of armaments, a ceramics industry and the making of cigarettes and quinine.

Transport

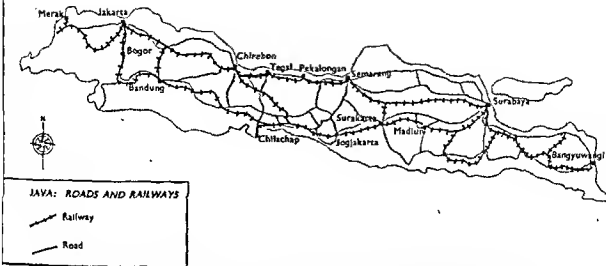
Java has excellent systems of land transportation, which make communication easy between various parts of the island.

Railways

The railway system is well developed, with nearly 3,500 miles of main running lines. This is more than three times the total railway mileage of West Malaysia whose total area is about the same as that of Java. The railway network in Java is so adequate that hardly any area is beyond 50 miles from a railway.

There is a northern trunk line which joins Jakarta in the west to Surabaya in the east. It links all the important ports and towns along the north coast, including Cirebon, Tegal, Pekalongan, Semarang and Rembang. This line is also linked to Merak on the Sunda Strait, from which a railway ferry links Java with southern Sumatra.

The southern trunk line joins Bogor and Bandung in the west with Chilachap and Jogjakarta in the south of Central Java, and with Surakarta and Madiun in the interior, continuing eastwards to Surabaya. This southern line has an eastern continuation from Surabaya to Bangyuwangi in the far eastern end of the island. There are several north-south lines which connect the towns on the north coast with those in the south. These shorter rail routes make



use, of gaps between the mountains in the Central Belt. There are also several express services between the chief towns.

However, about 50% of the locomotives and carriages are very old and need to be replaced. There is also the problem of the shortage of coal. One of the steps to solve these problems has been the purchase of several diesel locomotives. Electric trains run between Jakarta and Bogor.

Roads

The Javanese road system too, is fairly elaborate. It includes almost 70% of the best asphalt roads in the whole of Indonesia. The total length of such asphalt roads is nearly 5,600 miles. This is about the same as the total mileage of good metalled roads in West Malaysia. In addition, there are some 8,700 miles of non-asphalt roads, making a total of 14,300 miles of roads on the island. The trunk road runs from Jakarta to Surabaya. Other main roads join all the more important towns both in the interior uplands and in lowlands. Yet other roads serve as feeders to the railways and the main roads. Many stretches of main roads follow or parallel the railways, but many others, especially the north-south

roads, serve areas which are not covered by railways. Besides the bus services between the important towns, there are many pony carts plying along the minor rural roads.

Water Transport

The rivers of Java play a very small part in the transportation system of the island. Shipping, however, is important, both along the coasts of Java and between Java and the thousands of Indonesian islands. Of all the Outer Islands, Sumatra alone bypasses Java to a large extent in its international trade, as it has direct trade dealings with Singapore, Penang and other foreign ports. The other islands, however, conduct their external trade mainly through Javanese ports.

Most of the inter-island shipping services have been operated by PELNI (Pelayaran Nasional Indonesia) which has a fleet of some 270 vessels. There is also a state-owned 'Jakarta Lloyd' Shipping Company, which operates international services to Holland, Hamburg and London.

Air Transport

Air transport is essential for providing quick communication in such a large insular country as Indonesia, with its

territories scattered over a wide region. The Indonesian Government has its own airline company, Garuda Indonesian Airways. It operates a domestic network of regular air services to some 35 Indonesian

cities and towns, including services to remote West Irian. Garuda Indonesian Airways also runs services to Singapore, Kuala Lumpur, Hong Kong, Manila, Tokyo and other cities.

EXERCISES

1. Describe and account for the distribution of population in Java.
2. With the aid of sketch-maps show the main features of the physical geography, including climate, of Java.
3. With the aid of a sketch-map, divide Java into its physical regions and briefly describe each of the regions.
4. Describe the general agricultural activities of Java.
5. Compare and contrast the agricultural activities of West Malaysia with those of Java.
6. What are the factors responsible for the large population and high population densities in Java?
7. (i) Compare and contrast the climate of Jakarta with that of Singapore.
(ii) Describe the position and importance of Jakarta.

8.

Area in square miles		Total Population
Java	51,000	51,000,000
Sumatra	104,000	11,000,000

- (a) From the information given above, calculate the average density of population per square mile in Java and Sumatra.
 - (b) Explain why the average density of population differs substantially in these two islands.
9. Compare and contrast the agricultural development of Java with that of the outer islands.

Indonesia: The Outer Islands

SUMATRA

Sumatra is one of the largest of the several thousand islands and islets which form the Republic of Indonesia. With an area of 164,129 square miles, it is the second largest territory in the Republic. It stretches for about 1,100 miles in a north-west to south-east direction. The island is narrow in the north and broad in the centre and south. It extends from 6°N latitude to 6°S, and is cut into two latitudinal halves by the equator. The island is bounded in the east by the Strait of Malacca, in the west and north by the Indian Ocean, and in the south by the Sunda Strait. It lies on one of the world's trade routes via the Strait of Malacca and on one of South-East Asia's main routes via the Sunda Strait. Partly owing to this geographical situation, there has been greater development on this island than in Borneo, but Sumatra is much less developed than Java. Although its total area is more than three times that of Java, its population is less than one-quarter that of the smaller island.

Physical Features

Sumatra may be divided into four main physical divisions which stretch lengthwise in parallel belts. They are (i) the Mountain Region; (ii) the West Coast Plain; (iii) the East Coast Plain; and (iv) the Eastern Foothills.

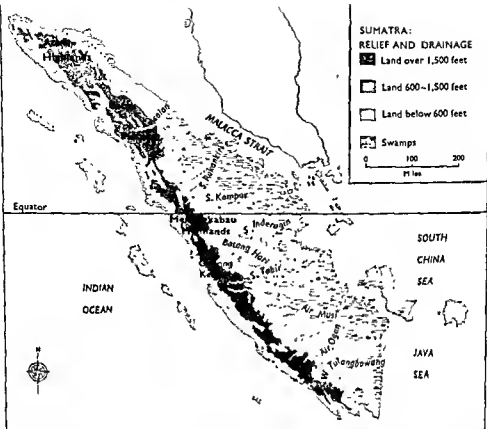
(i) THE MOUNTAIN REGION

Somewhat like the Andes of South America,

the Mountain Region of Sumatra consists of a great system of mountain ranges stretching from north to south along the western side of the island. In the north of the island, however, the Mountain Region is broad and occupies a central rather than a western position. The mountain ranges consist of young Alpine fold mountains similar to the South American Andes, though they are not as high. Both the Sumatran mountains and the Andes have many volcanoes in their midst, but the number of volcanoes in Sumatra is much greater.

The western edge of the Mountain Region forms a steep mountain wall facing the Indian Ocean. This mountain wall has made approach into the country very difficult from the western seaboard and this factor has hindered the development of the West Coast Plain.

The mountain system is a complex one, with mountain ranges, volcanoes, inter-montane plateaus, rift valleys and interior basins forming a complicated pattern of relief. Between the mountain ranges, there are rift valleys caused by faulting and other earth movements. The rift valleys are so arranged that they form a longitudinal trough (*longitudinal* means running lengthwise), stretching almost the length of the mountain system. This longitudinal trough is, however, far from continuous, and there are many separate depressions or basins along the trough. One of the inter-montane basins is the important Bukit Tinggi basin. Most of the interior basins



are in the northern half of the Mountain Region.

Above the general level of the mountain ranges rise many major volcanic mountains. The majority are about 8,000 feet above sea level, but some are much higher. Gunong Kerinci, which is 12,470 feet in height, is the highest mountain in Sumatra. Most of the volcanoes are near the interior basins, and many of them are still active. The volcanoes are more numerous in the central and southern parts of the mountain system.

From north to south, the Mountain Region may be sub-divided into four main highland areas. In the north are the *Acheh Highlands* which consist of several ranges with intervening valleys. South of the Acheh ranges is the volcanic *Batak Plateau*, in

which Lake Toba partially occupies a great depression. Lake Toba, which is 50 miles long and some 500 square miles in area, is the largest lake in the country. It is surrounded by high cliffs and volcanoes. The volcanic material in the northern parts of the Batak Plateau have been heavily eroded and great quantities of the eroded material have been transported eastwards to the area near Medan on the east coast. These volcanic material form fertile soils on which several plantation crops are grown on a large scale.

In the central portion of the Mountain Region, around the equator and south of it, are the *Menangkabau* or *Padang Highlands*. This is an area with ridges and fertile basins. Farther south are the *Benkulen Mountains*.

which have a simpler pattern consisting of two main ranges. The Menangkabau Highlands and the Benkulen Mountains are often collectively called the *Barisan Mountains*, a term which simply means "a line of mountains".

(ii) THE WEST COAST PLAIN

Between the Mountain Region and the Indian Ocean is a narrow coastal plain which consists of patches and strips of lowland edged by raised coral beaches. The discontinuity of the plain is caused by mountains and spurs reaching out almost to the sea. The soils are generally sandy and relatively infertile, except in some parts where alluvial fans and flats have been formed with deposits brought down by a few larger rivers. Most of the rivers, however, are short and swift, and do not deposit much of their loads on the plain itself. There are also small areas in the West Coast Plain, which are poorly drained and swampy. These unfavourable conditions combined with the absence of good natural harbours and the barrier presented by the steep western wall of the Mountain Region, hinder development of the West Coast Plain.

(iii) EAST COAST PLAIN

In contrast to the narrow West Coast Plain, the eastern lowlands and swamps of Sumatra form a very extensive East Coast Plain which occupy more than half the total area of the island. This region is thus the largest of the four physical divisions into which the island is divided. The East Coast Plain stretches from the very north to the very south of the island. It is narrow in the north where the Mountain Region is broad and its foothills reach close to the sea. But the central and southern portions of the plain are very broad. Along the

seaward side of the plain is one of the most extensive areas of swampland in the world. These swamps are most prominent in the southern two-thirds of the plain, where they reach a maximum width of 150 miles in certain places. In the north, there are only narrow strips of swampland.

The East Coast Plain is drained by many large rivers which rise in the Mountain Region. The Sungai Asahan in the north flows from Lake Toba. Other rivers are the Sungai Rokan, the Sungai Kampar, the Batang Hari (Jambi) and the Air (Ayer) Musi on which Palembang stands. These and other rivers have brought down great quantities of volcanic and other material to form the great alluvial lowlands in the east.

The large deltas and the coastal belt, up to about 12 miles inland, are flooded by tides each day. These tidal swamps are covered with mangrove forests. The great swamps farther inland are freshwater swamps covered with other types of forest vegetation. These great swamps of the East Coast Plain are a serious hindrance to human settlement and economic development. The uncleared forests in this region are as extensive as the forested and undeveloped areas in the Mountain Region and large parts of the West Coast Plain.

However, in the slightly higher inland parts of the plain, in the higher and drier areas between the rivers and in the northern and southern portions of the plain, agricultural development and settlement have taken place. Thus the East Coast Plain is not altogether an unattractive and undeveloped region.

(iv) THE EASTERN FOOTHILLS

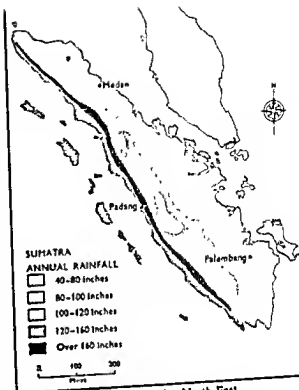
Between the Mountain Region and the East Coast Plain is a belt of foothills, which

season', especially in the western part of the country. It should be noted that the North-East Monsoon plays very little part in the climate of the southern half of the island.

In the northern half of Sumatra, the South-West Monsoon comes in great force in April, bringing heavy rainfall to its western side. The rainfall in Padang and Bukit Tinggi, for instance, rises considerably during this time. The South-West Monsoon continues from April to October. November and December are transitional months, when the North-East Monsoon begins to arrive in northern Sumatra. The North-East Monsoon lasts for only about three months, mainly from December to February.

The North-East Monsoon which arrives in November or December does not bring as much rain to the low-lying East Coast Plain as to the western mountains. The wettest months are October, November and December.

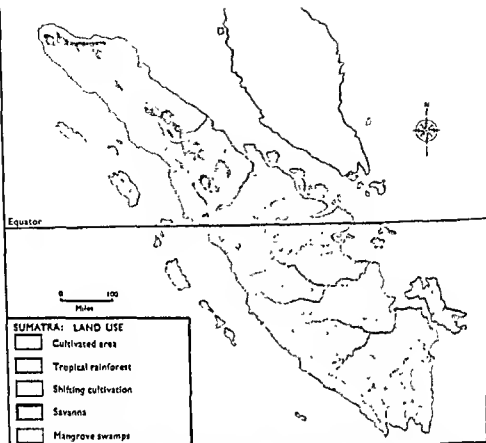
Sumatra may be divided into three rainfall belts: the very wet western belt, the drier eastern belt, and an intermediate central belt. The western belt, consisting of the exposed and unsheltered west coast areas and the western mountain region, has an annual rainfall of more than 120 inches. Many of the exposed higher locations record an annual rainfall of over 160 inches. Padang, for instance, receives about 180 inches a year. This belt receives rain from the South-West Monsoon, the North-Westerlies and the North-East Monsoon. The eastern drier belt has an annual rainfall of between 80 and 100 inches. Medan's annual rainfall is only 79 inches, while Palembang's annual rainfall is 102 inches. The eastern belt is in the rainshadow of the western mountains during the South-West Monsoon and the period of the



North-Westerlies. During the North-East Monsoon, the sheltering effect of the Malay Peninsula and the low relief of the eastern belt result in a relatively lower rainfall. Finally, there is a central zone in the interior which is an intermediate belt where the rainfall is between 100 and 120 inches.

Primary Production AGRICULTURE

Most parts of Sumatra are still under an equatorial rainforest cover. The areas which have been opened up for agriculture and mining form only a small proportion of the total area of the island. In addition to the geographical factors which have hindered development, there is an historical factor to be taken into account. The island was brought under Dutch control only in the early years of this century. Sumatra therefore did not undergo the process of economic



development and population expansion which Java experienced under the Culture System of the Dutch during the last century.

In economic development, Sumatra occupies an intermediate position between Borneo and Java. It is more developed than Borneo but much less than Java. Still, in primary production, Sumatra is a very important Indonesian territory as it produces most of Indonesia's output of rubber, petroleum and tin as well as a considerable proportion of the Republic's output of other commodities such as fish, tobacco, coconuts, tea, pepper and coffee. In the production of rice, sugar and tea, it is less important than Java, and in the production of coconuts, it is less important than Sulawesi and other

islands in eastern Indonesia.

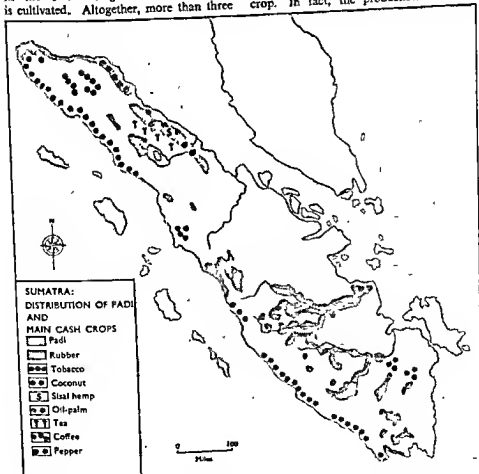
PADI CULTIVATION. A large proportion of the population of Sumatra is engaged in shifting cultivation. The primitive hill people grow root crops such as tapioca in temporary forest clearings. The more developed shifting cultivators grow dry padi and maize as well as root crops.

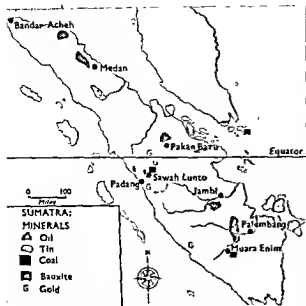
Wet padi is cultivated mainly as a subsistence crop only in some favourable areas. In the narrow coast of Aceh in the north, wet padi is grown in relatively small alluvial delta flats. In the upper and middle valleys of the Batang Hari and the Air (Ayer) Musi, wet padi is grown in the fertile alluvial and volcanic soils in the foothills and better drained lowlands, where

the means of controlling the water supply are available. Padi is also grown in the fertile alluvial basins among the western mountains, especially in the Menangkabau or Padang Highlands, where padi is intensively cultivated as a cash crop as well as a subsistence crop in the fertile volcanic soils around Gunung Merapi. In the extreme south, wet padi is grown in areas near the Lampung coast where the soils were made fertile when the great explosion of Krakatau in 1883 scattered volcanic ash over the neighbouring areas. There is also a fertile alluvial and volcanic belt round Lake Toba in the Batak Highlands where padi is cultivated. Altogether, more than three

million acres of land in Sumatra are devoted to the growing of both irrigated and non-irrigated padi.

RUBBER is the most important cash crop in Sumatra and in Indonesia as a whole. Indonesia ranks a close second to Malaysia as a world producer of natural rubber. The crop is planted in many parts of Sumatra. The foremost area is the foothill country to the west of Palembang and Jambi. In this huge area, the rubber estates and smallholdings occupy the areas higher than those occupied by rice. Most of the smallholders plant rubber as a cash crop in addition to their growing of padi as a food crop. In fact, the production from the





rubber smallholdings in Sumatra far exceeds that of the large estates, amounting to about 65% of the total rubber production for the island as a whole.

Another major producing area is the hinterland of Medan. This area occupies the foothills and better drained lowlands to the east of the Batak Highlands. Neutral-basic volcanic material transported by rivers from the northern part of the Batak Highlands have made the soils in this area very fertile. Large estates, established by the Dutch and other European companies and now mostly owned by the State, are devoted to the growing of cash crops such as rubber, tobacco, tea, sisal hemp (a fibre-yielding plant with sword-like leaves), oil-palm and coconuts. In this area is the largest concentration of plantation agriculture outside Java. Of the two most important crops, namely, rubber and tobacco, the total acreage under rubber now exceeds that under tobacco. The rubber and tobacco estates are near and around Medan, while the other crops occupy situations farther south and south-east. Tea estates occupy the higher and wetter inland areas.

Rubber is grown in other areas such as the Lampung area in the south, the Bukit Tinggi basin and other depressions in the longitudinal trough, and in many parts of the eastern foothills. In these areas, rubber is grown mainly in smallholdings.

OTHER CROPS Of the other crops, tapioca and maize are the main secondary food crops. Coconuts, pepper, coffee, groundnuts and soya beans are cash crops. Maize is grown by both shifting and sedentary cultivators. Coconuts are grown in smallholdings in many areas along both the east coast and the west coast. Pepper is planted in the eastern part of Acheh and in the southernmost part of the island south of Teluk Betung. Coffee is grown in the hilly districts of Acheh and parts of the west coast.

FISHING

Of all the Indonesian territories, Sumatra is the most important in the production of fish from sea fisheries as distinct from inland fisheries. Among the coastal villages engaged in fishing, especially along the east coast, the fishing port of Bagan Siapiapi, (Si Api-Api) at the mouth of the Sungai Rokan, is outstanding. The fishermen here, nearly all Chinese, are responsible for more than half the total catch landed from sea fisheries.

PETROLEUM

Petroleum is the most important mineral product of Sumatra. It is the second main export commodity of Indonesia. There are four areas where petroleum is produced. The most important area consists of the oilfields to the west of Palembang. The next important area is the neighbouring oilfields to the south-west of Jambi. Third is the Acheh and North-East oilfields to the north of Medan. Finally, there is the new

Minas oilfield in the Siak Valley in central Sumatra. This oilfield is near Pakan Baru, from where the oil is piped to Dumai on the east coast. The Palembang oilfields produce about half the total output. Some of the crude oil produced in the island is refined at Sabang (an island to the north), Medan, Palembang and Jambi. The rest is exported to Singapore, the Philippines and other countries.

TIN

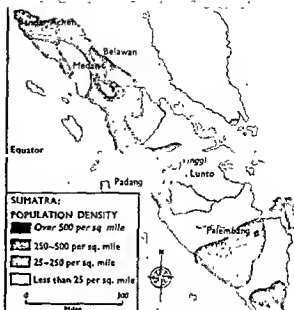
Sumatra produces practically all the total Indonesian output of tin. The metal is mined at the islands of Bangka, Belitung and Singkep, which are situated off the east coast. The alluvial deposits are worked mainly by the Chinese who use the gravel-pump method. Some of the alluvial deposits being worked consist of 'sea tin' and are mined offshore by dredges. Bangka, the largest of the three islands, produces some 60% of the total tin output. Belitung produces about 30%, while Singkep accounts for the remaining 10%. There has been a decline in the production of tin.

OTHER MINERALS

Bauxite (for manufacturing aluminium) is mined at the island of Bintan in the Riouw Archipelago which is administratively part of Sumatra. The annual production is large, amounting to about 700,000 tons. This represents a marked increase after some years of decline.

Gold is mined in many localities, especially in the Menangkabau Highlands and other mountain areas. But the total output is very limited.

Coal is mined in two main areas. One of these is the Umbilin basin to the east of Padang. The mining centre here is Sawah Lunto. A much more important area is the



Bukit Asam coalfields near Muara Enim farther south, situated in the eastern foothills of the Benkulen Mountains. This coal-mining area is linked by rail to Palembang. The total output of coal has greatly declined, and the Indonesian railways face a serious shortage of coal as fuel for their locomotives.

Population

The population of Sumatra is more than 16 million. This is less than one-quarter the population of Java which is a much smaller island, less than one-third the size of Sumatra. The average density of population in Sumatra is about 100 persons per square mile, compared with Java's average density of 1,400 to the square mile.

The distribution of population forms a simple pattern, with a few areas which are densely populated, a few others with fair densities, and the rest of the country sparsely populated.

The most densely populated area is the upland area of Bukit Tinggi and the neighbouring districts in the Menangkabau Highlands, including the coal-mining centre

of Sawah Lunto and extending to the nearby coastal district of Padang. In this area, there are densities of almost 1,000 per square mile in some districts. The population is concentrated in the intermontane basins with better-than-average soils and inhabited by the most advanced people in Sumatra, the Menangkabaus, who have long maintained as high a level of agricultural practice as that of Java and Bali. They are also advanced in artistic craftsmanship and skilled in trade. The people are engaged in intensive padi growing, partly on a commercial basis, and the cultivation of tobacco, rubber, tea, coffee and coconuts, as well as in the mining of coal and gold. In the port of Padang and the provincial capital of Bukit Tinggi, the people are engaged in urban functions, too, such as industrial and commercial activities. The area is fairly well served with road and rail transport and also shipping facilities at the port of Padang.

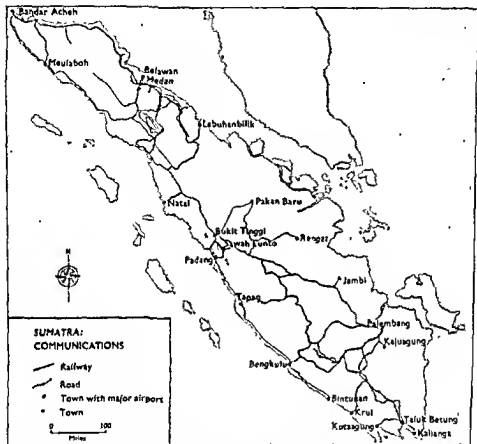
The next area with a large concentration of population but with lower densities than in the Menangkabau Highlands is that forming the hinterland of Medan and the nearby Batak country. Here the factors responsible for the population concentration and density are fertile soils, the establishment of plantation agriculture on a large scale and a long tradition of irrigated padi cultivation among the Bataks. The Bataks grow wet padi in valleys and on terraced hill slopes. Besides, there is in the district north of Medan an oil industry which has provided an additional factor in the population growth. Outside the urban districts of Medan and its outport, Belawan, and the neighbouring oil industrial district, the population is mainly an agricultural one. The people mostly work in the tobacco, rubber and other estates, while the Bataks are engaged in the intensive cultivation of

padi and in growing other crops. The future population densities in the Medan area are likely to rise with the completion of the great Asahan River project which will produce a huge volume of hydro-electricity for use in several large-scale industries being planned in various parts of northern Sumatra.

Another area with a moderately dense population is the Aceh coast where the Achinese support themselves by growing wet padi in the fertile alluvial deltas and valleys and cultivating rubber, coconuts, spices, tea and coffee, as well as rearing goats and cattle.

Other areas with fair population densities are the hinterland of Palembang and the Lampung coast in the south. The hinterland of Palembang consists of the rubber and padi growing areas to the west of Palembang and the oilfields to the west and north-west of the city. The agricultural population supports itself by cultivating padi in the valley of the Air Musi and planting rubber, coffee and other cash crops in the foothills where the soils are of the basic volcanic type. Many people work in the oil industry and many others who live in Palembang are engaged in business and industrial activities. In the Lampung area in the extreme south of Sumatra, the fair population densities are mainly due to the fertile soils derived from the volcanic ash spread from Krakatau, which support the cultivation of rice and cash crops such as pepper, rubber, tea, coffee and sisal hemp. The population density has been boosted by the fairly large-scale immigration of settlers or colonists from over-crowded Java.

The island of Bangka and Belitung are also fairly densely populated. The people on these islands are mainly engaged in the tin mining industry. Other areas in Sumatra are sparsely inhabited, especially the huge



coastal swamps and inland swamps of eastern Sumatra and the higher parts of the western mountains. The swamps will remain as areas of very low population densities, unless large-scale drainage and reclamation are carried out. The high mountainous areas and the interior of forested uplands are inhabited by tribes of shifting cultivators. Other areas of very low densities are parts of the West Coast Plain and many areas of the eastern foothills where the soils are infertile

and where means of transportation are completely lacking.

Transport

Railways

There are some 1,220 miles of railway track in the country and they form a very incomplete and inadequate system. In the northern part of the east coast, there is a fairly long line connecting the town of Bandar Aceh (Kota-*raja*) in the far north

SOUTH-EAST ASIA

with Medan, and extending southwards to Rantau Prapat. The Aceh stretch of this line, however, has not been fully restored to working order since the Japanese Occupation. In the south, there is a railway connecting Palembang with the rubber growing area in the foothills and the Bukit Asam coalfields to the south-west. It also links Palembang with Teluk Betung in the extreme south. In western Sumatra, there are railway connections between Padang and Bukit Tinggi and the coal-mines at Sawah Lunto. The railways of Sumatra are not well organised and managed, and most of the locomotives and other equipment are very old and need to be replaced.

Roads

The road system of Sumatra is much better than the railways. There is a north-south trunk road, more than a thousand miles long, linking Bandar Aceh in the north to Teluk Betung in the south. A stretch of this road runs through the Mountain Region from Lake Toba to Bukit Tinggi, mostly following the longitudinal trough and serving the interior basins. The Lake Toba district is connected by road with both the east coast and the west coast. Across the Benkulen Mountains in the south, there is a road leading from Bengkulu to Palembang. South of Tanjung Balai on the east coast, the roads mostly avoid the great swamps which are a serious obstacle to communications.

Sea transport

Along the west coast, only Padang is a good port, especially after the construction of a harbour at its outport. The rivers of the west coast are not navigable by ocean-going ships, but the eastward flowing Musi is navigable as far as Palembang and the

Batang Hari by smaller craft as far as Jambi. Palembang and Belawan, near Medan, are the main ports. But the facilities for shipping and maritime trade with other islands of Indonesia have been greatly reduced after the cancellation of the operating licence of the Dutch K.P.M.

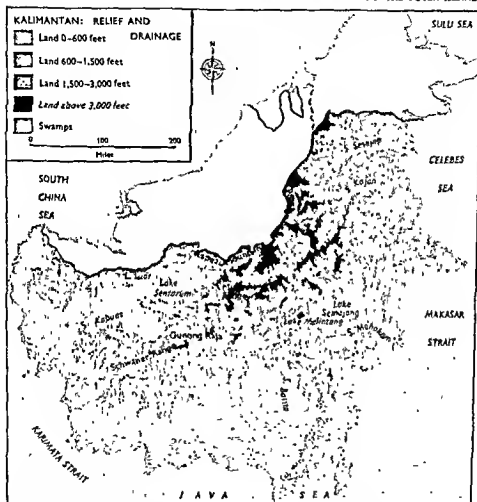
Air transport

Garuda Indonesian Airways operates regular services to several parts of Sumatra. The main airports are Palembang, Medan, Jambi, Padang, Bandar Aceh, Pakan Baru near the new Minas oilfield and Teluk Betung in the south.

Towns

Palembang, situated on the Musi about a hundred miles from the sea, is the chief port of Sumatra and the second largest town. It is the centre of the largest oil-producing area in Indonesia and is also the chief outlet for the rubber and other products of its large hinterland. It is mainly an oil town with refineries nearby and is also an important commercial centre. It carries on a large proportion of its export trade with Singapore.

Medan, the provincial capital of North Sumatra, is the largest city in Sumatra. It owes its growth mainly to the fact that it lies near a rich plantation area where cash crops such as tobacco, rubber, tea, oil-palm, sisal and coconuts are grown on a large scale. It exports petroleum as well as the products of the large plantations. As the river on which it is sited has been silted, its commodities are exported via its outport, Belawan. Medan is well served with roads and railway. Its trade is to a large extent with Singapore and Penang. Another function of Medan is that of a port-of-call and a bunkering port for ships travelling



from Java to India and Europe.

Padang is the chief port along the west coast. It is the third largest town in Sumatra, and it serves the most densely populated area in the country. Padang is also the chief collecting and distributing centre for the greater part of the West Coast Plain.

KALIMANTAN

Kalimantan or Indonesian Borneo occupies nearly three-quarters of the island of Borneo. Its total area, 208,298 square miles, is much greater than that of any of the other large territories of Indonesia, namely, Sumatra,

KALIMANTAN.

JANUARY RAINFALL



0 100 200 300 Miles



West Irian (West New Guinea), Sulawesi or Java.

The interior of Kalimantan is mountainous and hilly, but the mountains are not so high as those of Sabah. The mountains south of the equator, the Schwaner Range and the border highlands north of the Kapuas river, have a east-west trend. North of the equator, the mountain and hill ranges, namely the Muller Range, the Iran Range, the Tama Abu Range and other ranges to the east of them, have a general north — south trend. Gunung Raja in the Schwaner Range is 7,472 feet in height and is the highest mountain in Kalimantan. Few other mountains reach 6,000 feet in height. Bordering these mountains and hills in the interior is an extensive belt of low-lying and flat land especially in the south and west of the country. Compared with Sarawak and Sabah, Kalimantan has a higher proportion of low-lying and swampy land which fringes its very long coastline.

The main rivers of Borneo all radiate from the mountains and hills of the interior.

Those in Sarawak and Sabah flow westwards, north-westwards and north-eastwards. The main rivers in Kalimantan flow eastwards, southwards and south-westwards. The most important rivers are the Kapuas, the Barito, the Mahakam and the Kajan. The Kajan flows into the Celebes Sea, the Mahakam flows into the Strait of Makassar, the Barito drains into the Java Sea and the Kapuas drains into the Karimata Strait. The Barito and the Kapuas have large deltas which form extensive swamps through which the distributaries often change their courses.

The mountains and hills of the interior of Kalimantan do not form a high and continuous climatic barrier, so that the northerly and southerly monsoons are able to penetrate inland. This fact and the equatorial position of Kalimantan are responsible for the heavy all-round rainfall which has caused advanced leaching of soils, with the result that the soils are generally of low fertility.

Climates

As Kalimantan lies across the equator

KALIMANTAN.

JULY RAINFALL



0 100 200 Miles

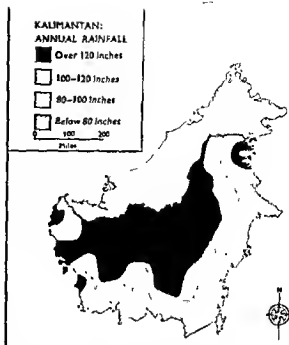


and stretches within 5°N. and 5°S. of the equator, it is in the equatorial climatic belt. It also lies in the paths of the North-East and South-East wind systems. Its climate is therefore of the equatorial monsoon type, with a uniformly high temperature of 80°F. all the year round and heavy rainfall at all seasons. The annual rainfall varies according to location and relief, but is generally over 100 inches, except in the south-east where it is about 90 inches. Pontianak has an annual rainfall of 126 inches, and its wettest months are from October to December. In July, the driest month, its mean monthly rainfall is 6.3 inches and in no other month does it fall below this amount.

The prevailing winds from November to March are the North-East Monsoon winds. These blow over the northern half of the country and are on-shore winds, bringing heavy rain to most parts of the country with the exception of the south-east. After crossing the equator, these winds are deflected to the left and become north-westerlies.

From June to September, the South-East Monsoon or South-East Trade Winds prevail. In Indonesia, these winds are called the East Monsoon. After crossing the equator, they swing to the right and become the South-West Monsoon in the northern half of the country. Although in the southern part of the country they are on-shore winds, they do not bring so much rain as the North-East Monsoon. They have come from the arid interior of Australia and have crossed less open seas than the North-East Monsoon. This is one reason for their being drier. Another reason is that in the southern half of Kalimantan, the relief is relatively low and this tends to decrease the amount of relief rain.

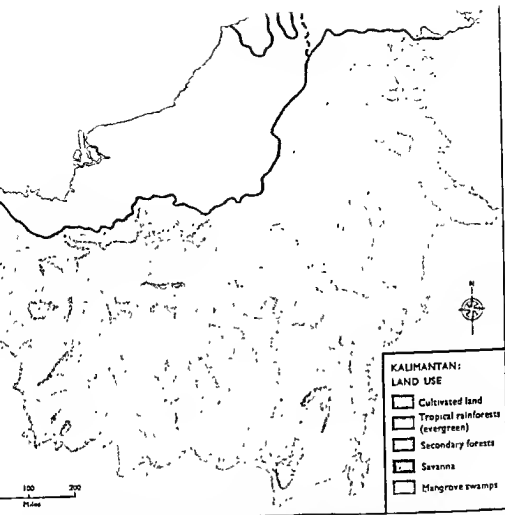
During the short transitional periods



between the monsoons, there is also rainfall of the convectional type and rainfall brought by local land and sea breezes. This is true especially of coastal stations.

Economic Development

For its great size Kalimantan, with its population of only about 4½ million is sparsely inhabited. Its population density of about 22 to the square mile is the lowest among the large Indonesian islands, apart from West Irian (West New Guinea). This sparseness of population reflects the relative backwardness of the country. The areas of settlement and development are concentrated in a few coastal or near-coastal areas, leaving the rest of the country with a very low population density. Large parts of the interior are sparsely inhabited by relatively backward tribesmen who hunt for their food, collect wild fruits and berries, or practise shifting cultivation and collect jungle produce for sale to the coastal dwellers.



Many areas in the interior are practically uninhabited.

There are several factors which account for the slow development and relative backwardness of the country as a whole. In the first place, the very size and compact shape of Borneo have made it difficult to penetrate into the country. Secondly, the dense equatorial rainforests which cover the greater part of the island and the peat swamp forests which stretch along the extensive coastal and deltaic swampland have also hindered penetration inland and have been

unattractive to immigrant settlers.

The non-volcanic soils of Kalimantan which have been badly leached and laterised by the heavy rainfall are in general of low fertility, except for the alluvial valleys of rivers. But the alluvial flats in the lower valleys and mouths of rivers are mostly badly drained. This, too, has discouraged development and settlement.

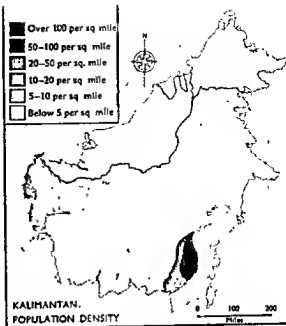
The many rivers in the country have also not provided access into the inland parts of the country. With shifting sand-bars at their mouths and distributaries and following

tortuous and changing courses through swamps, the rivers are difficult to approach and cannot be used by large vessels as routes into the interior.

Borneo has been situated off the main streams of human migration from the continent of Asia to the continent of Australia. These human streams proceeded southwards from regions north of West Malaysia, followed through the Malay Peninsula and Sumatra, on to Java and continued to the south. Besides, Borneo lies away from the main ocean lanes of world trade and from the chief trade routes within insular South-East Asia itself. This is particularly true of Kalimantan, which looks away from the mainland of Asia and from the countries adjoining the Strait of Malacca where empires rose and fell and where the main political and economic activities of the past occurred. Thus Borneo in general, and Kalimantan in particular, have been remote and isolated from the centres of human development in Asia.

Agriculture

There are two main areas of agricultural development. One is the south-east corner of the country, including the lower Barito Valley centred on Kandangan. This is the most densely populated area in the island. With its less rainy climate and less severely leached soils, there is more soil fertility to enable wet padi to be extensively grown. Rubber, copra and pepper are also produced. The inland and less swampy parts are better developed than the swampy coastal districts. The agricultural development has been brought about by immigrants mainly from Java. Banjarmasin is the chief port of the area. Near Banjarmasin, a scheme has been started to drain and reclaim areas of swampy land for colonisation by farmers



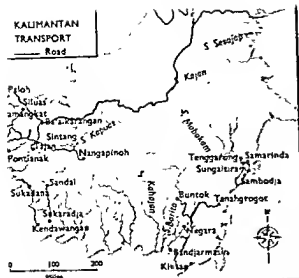
from over-populated Java, but the scheme has not been followed up owing to shortage of funds.

The second important area of settlement and cultivation is the coastal and near-coastal area from Pontianak to Sambas in the west of the country. There is rice cultivation in small patches as well as the production of rubber, pepper and copra. The middle Kapuas Valley is fairly well cultivated with rubber.

In the production of rubber and copra, Kalimantan occupies an intermediate position of importance between Sumatra and Sulawesi. Kalimantan exports a great deal of rubber but less than Sumatra. It also exports great quantities of copra, but its copra exports are exceeded by those of Sulawesi.

Petroleum

The main mineral wealth of Kalimantan is its petroleum. There are three main areas of production. The chief area is near the mouth of the Mahakam river, where



Samarinda is the centre of production. This is one of the largest oilfields in South-East Asia. The oil is refined at Balikpapan.

The next producing area is in the extreme north-east, at Tarakan Island and nearby Bunju Island. The 470 oil wells, which were destroyed during the Japanese invasion, have been restored to full production. The oil is shipped to Balikpapan for refining.

The third oil producing area is an inland oilfield in the Barito Valley near Kandangan. This oilfield has brought added prosperity to an important agricultural area.

Fishing

Kalimantan has greatly developed its fishing industry, especially the inland branch of the industry. The inland fisheries have produced as much as the total output from the inland fisheries of Java and Sumatra. The centre for processing fish is Pulau Laut, off the south-east coast. Plants have been established to dry, salt and can fish and to manufacture fish meal and fishing nets. There is also a centre for training fishermen in using modern methods of fishing.

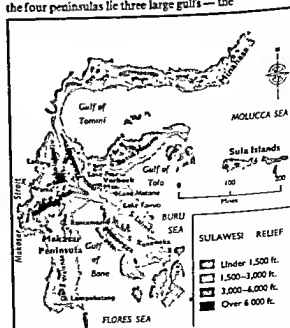
Transport

The use of small craft along the rivers

provides the chief means of transport. There is no railway at all in the whole country. There are three networks of roads in the Kandangan-Banjarmasin area, the Pontianak-Sambas-Kapuas Valley area, and the Samarinda-Balikpapan oil-producing area. Thus there are vast gaps in the road transport system. Coastal steamers are the chief links between the coastal ports and towns. There are air services between Banjarmasin and Tarakan in Kalimantan and Surabaya and Jakarta in Java.

SULAWESI

Sulawesi or Celebes, the fourth largest island territory in Indonesia, is situated to the east of Borneo from which it is separated by the Strait of Makassar. Its total area of 72,985 square miles is much larger than that of Java. The shape of Sulawesi is very peculiar, like that of an orchid or octopus. The island consists of four large peninsulas, one of which is very long. These peninsulas meet in a central knot of highlands. Between the four peninsulas lie three large gulfs — the



Gulf of Tomini in the north, the Gulf of Tolo in the east, and the Gulf of Bone (Boni) in the south.

Sulawesi is a very mountainous island. Its fold mountains have been subjected to much faulting, uplifting and subsidence. These earth movements have produced a maze of rift valleys and block plateaus. There are many lakes on the island, especially in the rift valleys. The largest are Lake Towuti, Lake Poso and Lake Matana. Most of the larger lakes are in or near the central part of the island.

The centre of the island has generally the highest relief. The relief becomes lower towards the ends of the peninsulas. The highest mountain, Gunong Rantemario (11,286 feet) is situated towards the north of the Makasar Peninsula (the South-West Peninsula). It is not much lower than the highest mountain in Borneo (Mt. Kinabalu) or that in Sumatra (G. Kerinci).

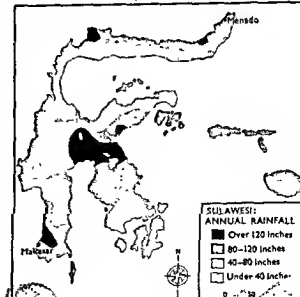
As mountainous relief is found over most of the island, there is limited low-lying land. The low-lying areas include a narrow coastal plain at the head or northern shore of the Gulf of Bone, small alluvial fans built by rivers, a narrow alluvial strip round Lake Tempe in the Makasar Peninsula, and the valley of the Sampar river in the South-East Peninsula. Elsewhere there are rugged uplands, generally over 1,500 feet in elevation, with several mountains in the interior rising above 8,000 feet.

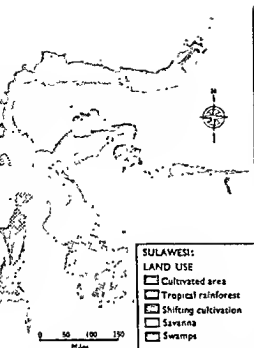
The coasts of Sulawesi are steep and edged by rocks and corals in almost continuous stretches. Off the coast, there are dangerous coral reefs. There is, therefore, a lack of good safe harbours, although the sea surrounding the island is deep. As the approach to the island is difficult, the island is on the whole not easily accessible.

While Sulawesi is generally not a volcanic

region, there are volcanoes in two areas — near the tip of the long North-East Peninsula, and in the south of the Makasar Peninsula. In the Minahasa area in the north-east, there are several volcanoes, and near Makasar in the South-West Peninsula, there is a dormant volcano, Gunong Lompobatang. The volcanic material in these two areas provide fertile agricultural soils, but elsewhere on the island, the soils are usually infertile and leached by the heavy rainfall during the wet season.

The climate of Sulawesi is of the equatorial monsoon type, but with a distinct dry season as in Java. The whole island excluding the North-East Peninsula lies south of the equator. It is dominated by the monsoonal air streams which affect most of Indonesia. The annual rainfall is between 80 and 120 inches, with most parts receiving above 100 inches a year. The rainfall is brought mainly by the northerly air stream during the wet season from December to March. The southerly or south-easterly airstream (the East Monsoon) is responsible for the drier conditions from April to October. The





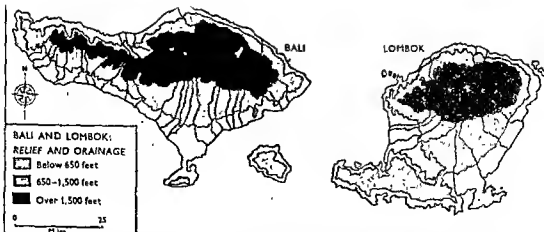
dry conditions are most marked in the sheltered interior valleys and at leeward locations generally to the west of mountains or highlands. The annual rainfall at Makasar is 113 inches, with as much as 27 inches in January, but only 0.4 inch in August and 0.6 inch in September. At Menado in the Minahasa area, the total rainfall for the year is 104 inches, with 18.6 inches in January and about 3.5 inches in August and in September.

The total population of Sulawesi is about seven million. Both Sulawesi's total population and average population density of 96 per square mile are much higher than those of Kalimantan. This is accounted for partly by the earlier occupation of the island by the Dutch and more especially because of fertile volcanic soils in the Makasar and Minahasa areas, which are able to support high population densities. There is also the absence of large swamps in low-lying areas along the coast. Apart from the two main areas where the population is concentrated,

there are moderate densities of population in the narrow coastal and other lowland areas. But in the uplands of the interior, large parts are sparsely populated by wandering tribesmen or groups of shifting cultivators. In the mountainous knot of highlands in central Sulawesi, the Torajas practise shifting agriculture, growing yams, maize and hill padi, although some of them plant wet padi in small alluvial valleys or basins.

In the Minahasa area around Manado at the end of the long North-East Peninsula, there is dense settlement owing to the practice of intensive agriculture based on the fertile soils. Besides the growing of padi as a subsistence crop, maize is cultivated partly for export, and coffee and coconuts are also grown on a moderate scale. The growing of coconuts is important in practically all the coastal areas in the peninsula and on the Sangihe Islands to the north of the Minahasa area. The main exports of this area are copra, maize, coffee, nutmeg and forest products. The majority of the Minahasans are Christians. Owing to the influence of the Dutch, they are most westernized in dress and customs.

In the Makasar area in the South-West Peninsula, a large population is supported by padi grown on the fertile volcanic ash soils derived from G. Lompobatang. The Makasarese and Bugis living in this area grow wet padi, maize, coffee and coconuts. The area of dense population stretches along the coast from Makasar to the Lake Tempe lowlands. More than 40% of the total population of Sulawesi live in this region. In this region, too, is found the only proper road system on the island. Elsewhere, communications by land are difficult owing to the rugged relief and are undeveloped owing to lack of settlement and economic



development.

In the Makasar Peninsula, coffee is grown in estates on the better drained soils of hill slopes up to 2,500 feet. It is an important export crop. Kapok, another export crop, is grown around Lake Tempe, G. Lompobatang and Tanete to the north of Makasar. *Makasar*, the chief town in this region, is the capital of Sulawesi and the main port and chief commercial centre. Its main exports are copra, coffee, maize, kapok, nutmeg, rattan and other forest products. Makasar is the world's chief rattan market.

In other parts of the island, copra is the most important export. A very large proportion of Indonesia's output of copra comes from Sulawesi. Other economic products include nickel and iron-ore mined at the Verbeek Mountains between Lake Towuti and Lake Matana in the northern part of the South-East Peninsula. The nickel and iron-ore are exported mostly to Japan from Malili, situated at the head of the Gulf of Bone. There are small deposits of other

minerals in various parts of the island, such as gold, copper, lead, zinc, mica, coal and asphalt. These have not been exploited yet, except for asphalt which is worked on Pulau Butung, a large island off the end of the South-East Peninsula.

BALI AND LOMBOK

Immediately to the east of Java is the island of Bali, separated from the main island by a narrow strait. To the east of Bali is the island of Lombok.

Bali is an island famous as a tourist centre. Both Bali and Lombok are, like Madura, well populated islands. They each have volcanic mountains in the northern half of the island and a limestone area in the south. In Bali, there is a tilted plain in the southern part of the island and a small limestone outcrop in the southern tip. In Lombok, a larger depression in the form of a rectangular plain lies between the northern volcanic area and the limestone plateau area



in the south

In both Bali and Lombok, padi is grown on the fertile soils of the alluvial plain. The intensive cultivation of padi extends to irrigated plateaus and terraces up to 2,000 feet. The volcanic soils are very fertile, in fact, more fertile than those in Java. The farmers are very skilled in irrigation methods. They build embankments, bamboo aqueducts and underground canals in the limestone hillsides. They grow padi not only on the plain and the terraced slopes of volcanic mountains, but also on limestone plateaus. Maize and dry padi are cultivated in the higher and drier areas which are not irrigated. Other crops include such cash crops as coffee (the main export of Bali), tobacco (especially in Lombok) and coconuts, which are grown up to 2,500 feet. The secondary crops include tapioca, yams, soya beans and groundnuts.

The people in Bali are mostly Hindus and not Muslims like the people of Java. They rear pigs and cattle on a considerable scale mainly for export to other parts of South-East Asia. The densities of population are high on both islands.

MALUKU

Maluku or the Moluccas, formerly known as the Spice Islands, consists of a group of islands situated between Sulawesi and New Guinea (Irian). Most of the islands are small volcanic or coral islands.

Maluku is among the least developed parts of Indonesia and has a total population of only some 900,000. Some of the smallest islands are more developed than the larger ones, largely because they were occupied earlier by the Portuguese and the Dutch, who encouraged the growing of spices, especially mace, nutmeg and cloves. The larger ones

were not occupied by the Dutch until this century and have remained relatively undeveloped.

Ambon, the provincial capital of Maluku, lies on an island to the south-west of the larger island of *Seram* (Ceram). It has a deep harbour and is the main port of Maluku and the focus of the air-routes in East Indonesia. Among its few industries are shipbuilding and ship-repairing.

On the little Banda Islands, some distance to the south of Pulau *Seram*, the growing of nutmeg is still important. Banda produces a large proportion of the world's output of nutmeg. Another small but well-populated island is *Ternate* to the west of *Halmahera*, the largest island in Maluku. On the island of *Seram*, there is a small output of petroleum at *Bula Bay* in the north-east of the island.

Most of the islands in Maluku are sparsely populated and the inhabitants grow the sago palm, their staple food, or obtain sago from wild trees. Padi is grown only in a few small areas. But the growing of coconuts is an important occupation throughout Maluku.

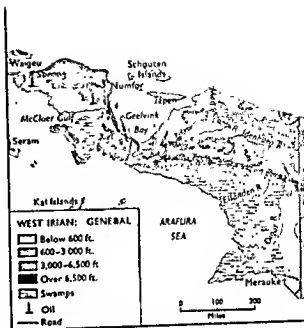
WEST IRIAN

West Irian, the easternmost territory of Indonesia, occupies the western half of the island of New Guinea. The eastern half is administered by Australia. The interior of West Irian consists of a system of high fold mountain ranges with several peaks rising to over 13,000 feet in elevation. These high ranges stretch from east to west, forming a serious obstacle to communications between the northern and southern parts of the country. They are bordered on the north by a narrow coastal plain and on the south by a broad coastal plain in which are huge tracts of swampland.

The soils are poor in most parts, except in the volcanic area in the Vogelkop Peninsula in the north-west. This is the most promising part of the country for the commercial production of crops and the exploitation of mineral resources. There are deposits of mineral oil and coal in this region which is also endowed with good natural harbours.

West Irian is an undeveloped territory, partly because it came late under Dutch control (in 1898) and mainly because it is remote from the main sea-routes of South-East Asia and had had little economic attraction for the outside world.

The total population of West Irian is unknown, as no official census has been taken, but it is estimated to be between 700,000 and 800,000. Except for groups of Eurasians, Indonesians and Chinese, the population consists of Papuans who are very primitive people living mostly in the interior. The population is very sparse for such a large territory. The most densely settled part is the northern coastal fringe and some islands nearby, e.g. Pulau Biak, which is an important focus of air-routes. There are two other areas of settlement—the Vogelkop Peninsula in the north-west, and the area around Merauke in the south-east. Many Eurasians of Dutch descent have migrated from Java to the Merauke district, where they are engaged in rearing livestock and planting padi.



In the Vogelkop Peninsula, the extraction of mineral oil near Sorong is the main industry. The labourers in the oilfield are mostly Indonesians. The export of crude oil forms about five-sixths of the total value of exports from West Irian. Small quantities of copra, nutmeg, crocodile skins and shells are also exported. Most of the inhabitants of the country depend on sago, yam and fish for their food.

There are only some three hundred miles of roads in the whole territory. Coastal shipping provides the chief means of transportation, especially for the bulk carrying of goods.

EXERCISES

1. Illustrating your answer with a sketch-map, divide Sumatra into its physical regions and give an account of each region.
2. Explain why Kalimantan is one of the least densely populated and developed territories in Indonesia.
3. Describe, and suggest reasons for, the distribution of population in Indonesia.

Chapter 14

The Philippines

The Philippines is an archipelago consisting of about 7,100 islands and lying some 600 miles off the south-east coast of Asia. Of the 7,100 islands more than half are without names and several hundreds are islets of less than one square mile each. The archipelago is spread over 1,000 miles from north to south and 625 miles from east to west. It stretches from latitudes 5°N to 20°N.

The total area of the country is 116,200 square miles and its total population is about 35 million spread unevenly over most of the larger islands.

Of the 7,100 islands in the archipelago, eleven large ones occupy 95% of the total land area. In the north is the largest island, Luzon. The second largest island is in the south, namely, Mindanao. Between them is a group of islands most of which are in the Visayan Sea and are called the Visayas or Visayan Islands. They are, in order of size, Samar, Negros, Panay, Mindoro, Leyte, Cebu, Bohol and Masbate (Mindoro and Masbate are often grouped with a number of islands near Luzon island to form the Luzon group). The Visayas may be divided into the Western Visayas and the Eastern Visayas. The Western Visayas are Panay, Western Negros and Romblon (to the north of Panay). The Eastern Visayas include Eastern Negros, Cebu, Bohol, Leyte and Samar. Then there are the outer groups of islands, the Palawan group to the west, with Palawan and 200 other little islands, and the Sulu archipelago between the south-west

of Mindanao and Sabah.

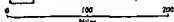
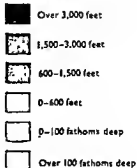
The Philippines forms part of the Pacific 'ring of fire' or girdle of volcanoes. Earthquakes are common and volcanoes dominate the landscape from the southern part of Luzon to the south of the Philippines. Of the volcanoes a large number are extinct, but a dozen are active, e.g. Mt. Mayon in the south-east of Luzon.

The islands are mostly mountainous and have high rugged relief. Many are edged with coral terraces or raised coral beaches and surrounded with coral reefs. The mountains in north and central Luzon show two parallel north — south lines of folding, but farther south the eastern line becomes a north-west — south-east line in southern Luzon and the Eastern Visayas, and the western line becomes a north-east — south-west line in the Western Visayas and Palawan.

The mountains were in the past subject to intense folding, tilting and vertical movements of uplifting or sinking. These are signs of the unstable nature of the earth's crust beneath the islands. The earth movements and the heavy rainfall have combined to produce very rugged and intricate relief features. The raised beaches and cliffs on the west and the presence of drowned valleys on the east give evidence of uplifting and tilting movements.

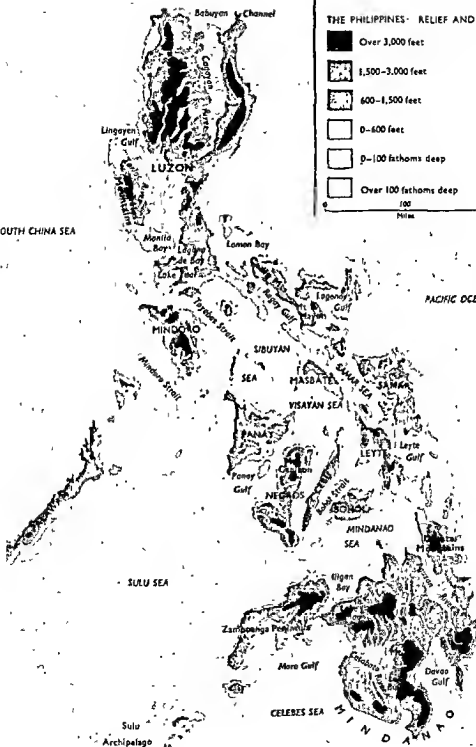
With so much of their area occupied by mountains and other uplands, the islands are deficient in lowland areas. Compared with the mountainous islands of Japan, the Philippines possesses only a relatively small

THE PHILIPPINES: RELIEF AND DRAINAGE



SOUTH CHINA SEA

PACIFIC OCEAN



SOUTH-EAST ASIA



Mt. Taal standing in the middle of a caldera lake.

total lowland area. The lowlands are either narrow and disconnected coastal plains usually less than ten miles wide, or inland valleys and depressions. Some of them are former gulfs or straits that have been filled in with sediment. The Central Plain of Luzon is a former strait that has been filled in with sediment and converted into a plain. The Cotabato Valley in the south-west of Mindanao is a former gulf similarly filled in.

Most of the land surface is above 1,600 feet. The foothills, between 600 and 1,600 feet in elevation, occupy a narrow belt between the mountains and the lowlands. The mountain ranges and ridges are usually between 2,000 and 6,000 feet. Rising from the midst of the ranges and ridges are mountain peaks and volcanic mountains.

Eruptions from the volcanic mountains have brought fertility to the soils in several areas, but only a proportion of the volcanic soils are basic in composition which weather into fertile soils. About a dozen of the volcanoes are active ones, e.g. Mt. Taal to

the south of Manila, Mt. Mayon towards the south-eastern tip of Luzon, and Mt. Apo to the west of the Gulf of Davao in Mindanao.

LUZON

Luzon (40,420 square miles) is the largest of the Philippine Islands. It may be divided into three regions, the northern section, the central section and the south and south-eastern section.

NORTH LUZON

North Luzon is large and massive. Its mountain ranges have a north-south trend. In the east is the Sierra Madre, and in the west is the Central Cordillera. Between them is a trough, which is an important agricultural area, occupied by the valley of the Cagayan river. The Central Cordillera consists of three parallel ranges with several peaks above 6,500 feet in height. Mt. Pulog (9,600 ft.) is the highest peak. Baguio in the southern part of the Cordillera is an important mining centre. The west coast strip of North Luzon, the Ilocos coast, is an important agricultural area inhabited mainly by the Ilocanos.

CENTRAL LUZON

Central Luzon is almost as broad as North Luzon but is less massive. It consists of a three-fold division of two mountain ranges and a central plain between them. In the east is the southern continuation of the Sierra Madre. In the west are the Zambales Mountains. Between them is the Central Plain of Luzon. This great plain, a key farming area, stretches for about 120 miles from Lingayan Gulf in the north to Manila Bay in the south. Formerly it may have been a strait which has been converted into a plain by the deposition of sediment brought by rivers and perhaps by a fall in sea level.

The alluvial deposits are more than 1,000 feet in depth.

Manila Bay, situated to the south of the Central Plain, provides a huge natural harbour. The main harbour stands near the mouth of a small river, the Pasig river, which flows from the shallow Bay Lagoon (Laguna) into Manila Bay.

SOUTH AND SOUTH-EASTERN LUZON

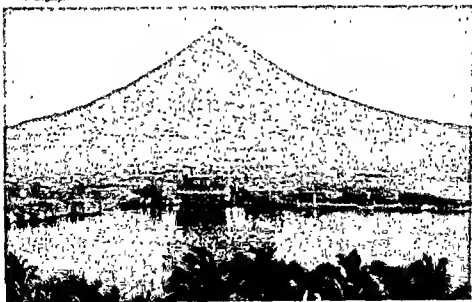
From Manila and Bay Lagoon southwards and south-eastwards, the coastline becomes very irregular, the mountains change their trend to north-west — south-east, and a number of volcanoes feature in the landscape. The irregular coastline includes several deep gulfs, bays and peninsulas. To the south of Manila is the active volcano, Mt. Taal. It is

a small volcano standing in the middle of a caldera lake, Taal Lake. To the east of this area are several extinct volcanoes. A narrow isthmus leads to the south-east peninsulas, where another group of volcanoes dominate the scene. Mt. Mayon, near the south-eastern end of Luzon, is one of the most fascinating volcanoes in the world. It has an almost perfect cone, with even slopes and a perfect peak. The symmetrical cone is about 8,000 feet in height and 80 miles in circumference. With so many volcanoes around, many parts of south and south-eastern Luzon have fertile volcanic soils

THE VISAYAN ISLANDS

The Visayan Islands between Luzon and Mindanao include eight moderately large

Mt. Mayon, towering 8,000 feet high, has been acclaimed as the world's most perfect volcano. The remarkable symmetry of its slopes has been the subject of many photographers. The town at its base is Legaspi.



SOUTH-EAST ASIA

islands and a number of small ones. Two of the eastern islands, Samar and Leyte, are very close together and are separated by a narrow strait. They have longitudinal ranges with a north-west — south-east trend. The elongated islands, Negros and Cebu, have ranges lying in a north-east — south-west direction. In the north of Negros is an active volcano, Mt. Canlaon. In Samar and Leyte, too, there are volcanic rocks, but in Cebu there are uplifted coral beaches and coral terraces along the coast.

The coasts of the Visayas are rocky and edged with narrow coastal plains, as the mountains and hills reach the sea at many places. In western Negros and eastern Panay, however, there are wider plains which make good agricultural land. Where the soils in the coastal plains are mixed with volcanic and coral material, a dense population can be supported.

MINDANAO

This large island in the south is almost as large as Luzon, but it is much less developed. As in Luzon, there are two large lowland areas. One is the Agusan Valley in the north-east and the other is the Cotabato lowlands in the south-west. They are depressions which have been silted up. The Agusan Valley lies between the Diuata Mountains to the east and a mountain range to the west. The development of this valley has been handicapped by the marshes and lakes in its middle section. The north — south range to the west of the Agusan Valley contains a number of volcanic mountains, of which Mt. Apo (9,690 ft.) is the highest peak in the country.

The interior of Mindanao consists mostly of high rugged mountains and undulating uplands and plateaus. In the north-central part of the island are several areas covered

with volcanic material. Lake Lanao in this region is now an important source of hydro-electric power and irrigation water. In the south-west of the island are the Zamboanga peninsulas. The larger and main peninsula is called Zamboanga del Norte, and the smaller ones to the east of it are called Zamboanga del Sur. Near the Zamboanga coast is "Mindanao Deep", the second deepest ocean trench known to man, next only to the Marianas Trench in the Pacific. Its depth, 37,782 feet, is much more than the height of Mt. Everest, the world's highest mountain.

To the south of Zamboanga del Norte stretches a chain of small volcanic and coral islands, the Sulu Archipelago. To the far west of the Visayan Islands, the long island of Palawan and other islands extend south-westwards towards the north of Sabah. Palawan is about 250 miles long and has mountains rising to 6,500 feet. Its coasts are edged with corals. In the waters around Palawan and Sulu are many pearl beds where divers search for pearls.

Climate

The climate of the Philippines is of the marginal tropical monsoon type. The main climatic factors are the latitudinal position (latitudes 5°–20°N), the maritime influences, the alternation of the South-West Monsoon and the North-East Trades, and the almost continuous north-south system of mountains.

TEMPERATURE

The temperature conditions are determined by the tropical latitudes, the maritime influences and the mountainous nature of the country. As the Philippines lies within the tropics, and as the country as a whole and the individual islands are surrounded by the sea, the climate is equable, with temperatures

Place	Lat. Long.	Alt.	Month													
			J	F	M	A	M	J	J	A	S	O	N	D		
MANILA	15°N		77	79	80	82	83	84	83	83	81	80	79	77	7	Temperature
		47 FT														Range
	120°E		INS.	59	67	70	74	59	47	16.6	16.1	13.9	7.6	57	21	61
ZAMBOANGA CITY	7°N		79	79	80	80	80	80	79	80	80	80	80	80	1	Temperature
		23 FT														Range
	122°E		INS.	20	24	17	22	33	44	49	41	44	59	42	33	41
BASCO	20°N		22	24	25	28	30	31	32	32	30	29	27	24	11	Temperature
		16 FT														Range
	122°E		INS.	9.4	4.6	4.9	4.5	9.4	4.4	11.3	14.9	13.4	12.9	14.3	15.1	122
SURIGAO	10°N		78	80	80	80	81	83	82	81	81	80	80	79	4	Temperature
		14 FT														Range
	124°E		INS.	21.9	14.5	13.1	10.2	6.3	5.2	4.8	4.8	6.2	10.1	16.6	24.3	140
BAGUIO	16°N		63	63	67	68	69	69	68	67	67	66	65	64	6	Temperature
		5,000 FT														Range
	121°E		INS.	17	11	7.8	5.4	14.6	14.3	30.6	46.7	29.6	14.2	2.8	2.4	195

CLIMATIC TABLE OF SELECTED STATIONS

relatively uniform and moderately high throughout the year. The tropical temperatures are, however, modified by the high altitudes in most parts of the country. At Zamboanga City, in the south-west of Mindanao, the temperatures vary between 79°F in January and 80°F in June, producing an annual range of only 1°F. At Manila the annual range is 7°F (77°F in January and 84°F in June). Even at Basco, in the extreme north situated between Luzon and Taiwan, the annual range is only 11°F (72°F in January and 83°F in June). This range is considerably smaller than that in Mandalay and Hanoi, both at about the same latitude as Basco. The annual range at Mandalay is 20°F and that at Hanoi is 21°F.

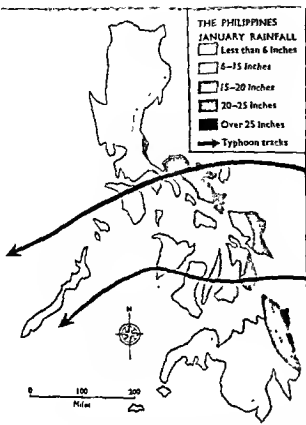
RAINFALL

The rainfall, however, shows considerable differences in various parts of the country

and in its seasonal distribution. The average annual rainfall for the country as a whole is 90 inches. But in some interior rainshadow areas, it is below 60 inches, while in many highland areas and exposed coastal locations it is more than twice that figure. The rainfall in most parts of the country is more than 80 inches a year.

The wind systems responsible for the rainfall are the South-West Monsoon from late June to the end of September and the North-East Trades, dominant from the month of November to May. The South-West Monsoon brings most rain during July, August and September. At its height it brings rain to nearly all parts of the country, with more rain to the western side of the archipelago.

The North-East Trades, the normal prevailing winds in the latitudes of the Philippines, exercise their influence mainly

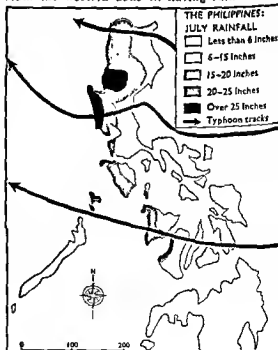


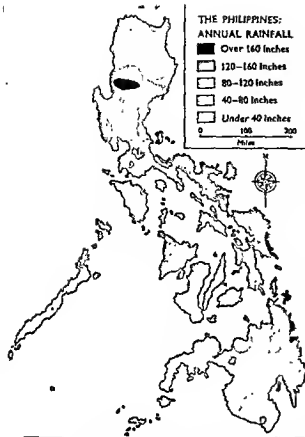
from November to May. The position of the country in relation to continental Asia is such that the North-East Monsoon from the mainland does not affect the Philippines. The North-East Trades bring heavy rain to the eastern fringes of the archipelago, especially during the months of December, January and February. West of the eastern mountains, they become increasingly ineffective as rain-bearing winds.

The Philippines may be divided into three rainfall zones, the western zone, the eastern zone, and the central or transitional zone. **THE WESTERN RAINFALL ZONE** The western side of the archipelago receives by far the greater part of its annual rainfall from the South-West Monsoon. This zone includes the western half of North and Central Luzon

and the western side of Mindoro, Panay, Negros and Palawan. Manila, for instance, receives 70 inches of rain from May to October out of its annual total of 81 inches. The rainfall at Baguio, about 125 miles north of Manila and at an elevation of 5,000 feet, totals nearly 180 inches during this period out of an annual total of 195 inches.

During the other months of the year, the western zone experiences a dry season which is very dry for 4 or 5 months. The western side of North and Central Luzon has the longest dry season owing to the rainshadow effects of the eastern mountain barrier. **THE EASTERN RAINFALL ZONE** The North-East Trades, which blow over the country from October to May, bring heavy rain to the eastern side of the archipelago especially from December to February. But the eastern zone also receives some rain during the period of the South-West Monsoon. It thus differs from the western zone in having rain



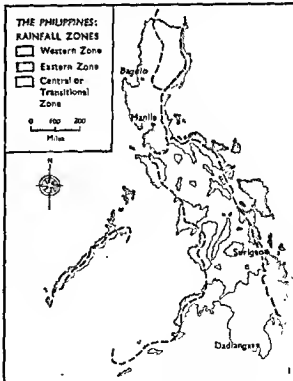


throughout the year. There is no true dry season and the monthly rainfall in the drier months does not fall below 4 inches. For instance, at Surigao in the north-east of Mindanao, the rainfall in the driest month of August is 4.8 inches. Another source of rainfall is the typhoons which originate to the east of the Philippines and bring rain to the eastern parts of the country, especially during the main typhoon season from July to November. The effects of the typhoons are most strongly felt in the east coasts of Luzon and Samar.





THE CENTRAL OR TRANSITIONAL ZONE This zone, with a transitional type of rainfall regime, includes the interior of North Luzon, the western part of South-East Luzon, the

THE PHILIPPINES

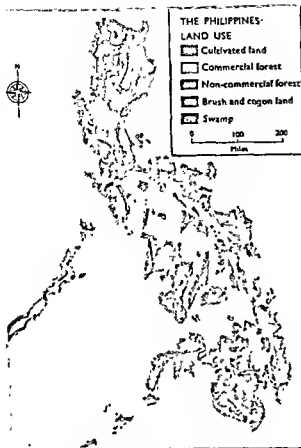
central or inner portions of the Visayan Islands between the Eastern and Western Zones, and the greater part of Mindanao to the west of the Eastern Zone. The eastern part of Palawan also falls within this transitional zone. Most areas in the zone experience some rainshadow effects during both the seasons of the South-West Monsoon and the North-East Trades, but receive most of their annual rainfall during the South-West Monsoon. The total annual rainfall is lower than that received in the Western or Eastern Zone. In the northern two-thirds of this zone, the rainfall regime is of the modified Western type, with a dry season which, however, lasts, only two or three months. In the southern part of the zone, there is no marked dry period, but there are some slightly drier months and the annual rainfall is among the lowest in the country, for example 39 inches at Dadiangas in the Cotabato region in Mindanao.



THE PHILIPPINES: LAND USE

-  Cultivated land
-  Non-commercial forest
-  Brush and cogon land
-  Swamp

0 100 200
Miles



Agriculture

Most countries in South-East Asia specialise in the cultivation of certain export crop or crops: Burma and Thailand (rice), Malaysia (rubber and oil-palm) and Indonesia (rubber and coconuts). The Philippines, too, is a leading world producer and exporter of certain agricultural commodities, namely, coconut products, sugar and abaca (Manila hemp). It ranks first among the world producers of coconut products and abaca, and is one of the leading exporters of cane sugar.

Although the country is very mountainous, the proportion of cultivated land is fairly high, about 27% of the total land area. This compares favourably with another

mountainous country in Asia, namely, Japan (only 17%). Food crops occupy some 70% of the total cultivated area and cash crops only 30%, but the cash crops are of greater economic importance, as they account for the greater part of the export earnings of the country.

The Philippines: Land Use

Commercial forest	38.3%
Non-commercial forest	14.9%
Marsh and swamp	2.0%
Open grassland	17.5%
Cultivated	27.3%

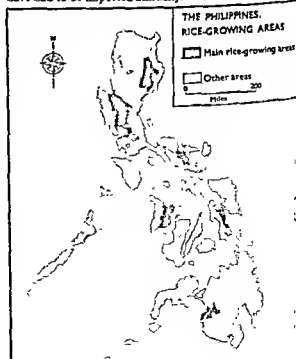
Rice

Rice is the staple food of about 77% of the population. Owing to the rapid growth of the population and insufficient rice production, the country has suffered from a recurrent rice shortage. Considerable quantities of rice, worth over M\$100 million, have had to be imported annually. The rice

THE PHILIPPINES: RICE-GROWING AREAS

-  Main rice-growing areas
-  Other areas

0 100 200
Miles



carried out as self-help projects by village people who supply the labour while the Government provides the materials and the technical assistance.

The Government has launched a crash programme to achieve self-sufficiency in rice, hoping that in a few years the country will become self-sufficient in rice and even have a surplus for export. The most important part of this programme is the construction and repair of many irrigation works. This is intended to overcome the serious lack of irrigation facilities in many farming areas. It will extend the acreage where double cropping of rice is possible. Another measure is the improvement of production techniques among farmers, including the use of better seeds and the greater use of fertilizers. Three high-yielding varieties of 'miracle rice' have been developed, and other countries of South-East Asia have shown great interest in these types of rice. Filipino farmers are encouraged to plant them.

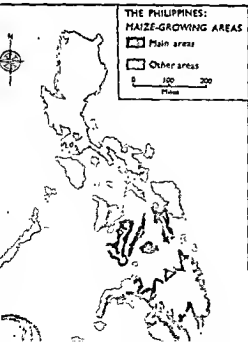
Filipino farmers use fertilizers more extensively than rice farmers in other South-East Asian countries. Yet only about 10% of the riceland is being fertilised. The Government grants loans to enable farmers to buy new types of seeds, fertilizers and better hand-tools. It also encourages the extension of mechanical farming. At present, mechanical farming is practised in the large rice farms and in the undeveloped provinces of Mindanao where large areas are available and suitable for this method of farming. About 10,000 tractors are used in these areas.

Maize

As a food crop, maize is second in importance only to rice, and in certain parts of the country it is the leading food crop. Maize is the staple food of about 25% of the population, especially the poorer section of the people in the Visayan Islands of Cebu, Negros and Leyte, and in Mindanao. Maize occupies nearly 24% of the total cultivated area.

In areas where conditions are not suitable for rice growing, but are favourable for maize cultivation, maize is the staple food and main food crop. Such areas include certain parts of the Visayan Islands, where porous soils have developed on coral limestone. In the central Visayas, in particular, the annual rainfall is only moderate. The arid soil and relatively dry climatic conditions are more suitable for growing maize than rice as maize is a 'dry' crop. As the population pressure is great, several crops of maize are grown each year.

Cebu is the main maize-growing area. More than half its cultivated area is devoted to the crop and it produces about one-quarter of the total national output of maize. In parts of Leyte, Negros and Bohol, maize is also the chief crop and staple food. Parts



of Leyte and Negros are becoming overcrowded and maize has to be imported from Mindanao where large quantities of surplus maize are produced in the northern part of the island.

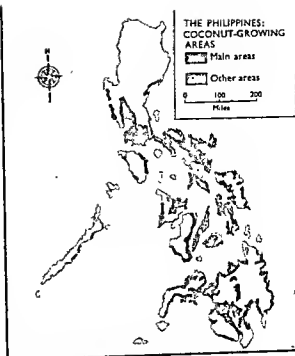
As the requirements for maize cultivation are not exacting, expansion in maize growing has been faster than that in rice cultivation.

Coconuts

The Philippines is the world's largest producer of coconuts and coconut products. It supplies about 65% of the total world output of copra and its total copra production is more than three times the combined production of Ceylon, Indonesia and Malaysia, the next most important producers of copra. It also supplies more than 40% of the world's need for coconut oil. Besides, it exports large quantities of desiccated coconut which is a dried shredded form of the white meat of the fruit, used for making confectionery, cakes, biscuits, pastry and pudding.

About 4 million acres of land are planted with coconuts. This is a much larger acreage than that under any other cash crop. The coconut industry supports about one-third of the population, that is, more than 11 million people. The total export earnings from copra, coconut oil and desiccated coconuts exceed the earnings from any other export commodity or group of commodities, including timber, sugar, minerals and abaca.

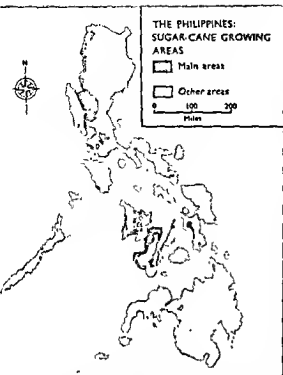
The coconut crop needs a warm and wet climate with rainfall well distributed throughout the year. It is therefore grown mostly on the eastern side of the country, where there is rain all the year round. Its cultivation is more widespread in areas south of 15°N latitude, where the typhoon danger is less. The coconut smallholdings and plantations are found not only in coastal



areas, but also inland from the coast and on foothills up to a height of 1,600 feet.

The southern and south-eastern parts of Luzon form the chief coconut-growing region. This region, stretching from the south of Bay Lagoon to the tip of the south-eastern peninsula, enjoys fertile volcanic soils, the absence of a long dry season and good rail and road transportation facilities. Manila is the main collecting and processing centre.

Among the Visayas, the coasts of the eastern islands are important coconut producing areas, especially the island of Samar. Cebu is the chief centre for collecting and processing copra. In Mindanao there has been a considerable expansion of the acreage under coconuts not only in the southern provinces of Davao and Cotabato and the south-western provinces of Zamboanga del Norte and Zamboanga del Sur, but also in the northern and eastern coastal areas. Coconut cultivation has also expanded in



the climatically less favourable areas, namely, the Cagayan Valley and the Ilocos districts in Luzon and the Western Visayas.

More than 80% of the coconut production comes from smallholdings. In the wetter eastern parts of the islands, most of the copra is dried by smoking in kilns, which produces better quality copra than that dried by the sun.

A sugar-cane plantation in Western Negros.



Sugar-cane

Sugar-cane is the second most important crop, next to coconut. Sugar features regularly among the top export earners. The Philippines is one of the world's leading exporters of cane sugar. The crop grows best in soils of sandy loam which are not swampy or flooded in the wet season. But it requires a great deal of water for several months of the year and a dry period for the cane to ripen properly. Sugar-cane is most suited to the fertile lowland areas in the western side of the country, where there is an alternation of wet and dry seasons.

The Central Plain of Luzon and Western Negros are the main sugar-producing regions. Together they account for about 85% of the total sugar production. The Central Plain of Luzon has rich alluvial soils and Western Negros enjoys fertile volcanic soils. In the Central Plain, sugar-cane is grown mainly in the eastern parts where it occupies the drier areas between rice fields. Most of the sugar-cane growers here are smallholders who plant both rice and sugar. But in Western Negros there are several hundred large sugar plantations, each 250-650 acres in area. As the extent of lowlands in Negros is not very great, the crop is also grown on uplands where there are volcanic or other fertile soils and where irrigation is possible. Sugar-cane is cultivated also in the coastal plains of Panay, the third most important sugar-cane growing area.

Although the Central Luzon Plain and the adjoining 'waist' of Luzon south of the Central Plain form a very important sugar-producing region, the cultivation of sugar-cane is subsidiary to that of rice. Here and in Western Negros it is usual to grow two crops a year with the aid of irrigation. There are more than forty sugar-mills in the country, more than half of them being in



An abaca plantation. Note the similarity of the abaca plant to the banana plant.

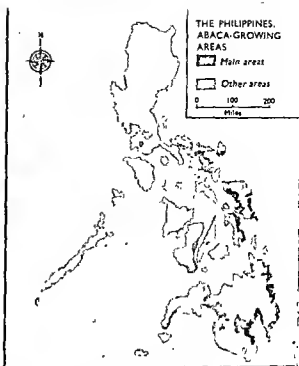
Negros and the rest mostly in Luzon and a few in Panay.

Abaca

Abaca, or Manila hemp, is a fibre-yielding plant which resembles the banana plant and grows to a height of 12 to 20 feet. The fibre is obtained from the leafy sheath of the shoots. Although the crop requires rain throughout the year, it grows best only on rich, well-drained soils. As the crop exhausts the soil fertility quickly, the most suitable areas are those with fertile basic volcanic soils.

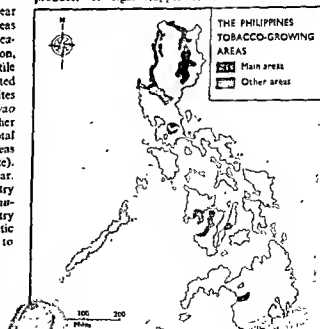
The uplands with volcanic soils near Davao in Mindanao and the volcanic areas in South-East Luzon are the chief abaca-growing regions. In the Davao region, abaca is extensively grown in the fertile volcanic soils formed from material ejected by Mt. Apo. The plantations occupy sites as high as 3,000 feet and more. The Davao and South-East Luzon regions together account for more than 80% of the total abaca output. Other abaca-growing areas are in the Eastern Visayas (Samar and Leyte). All these areas have rain throughout the year.

Most of the abaca produced in the country is exported, leaving about 10% for manufacture into cordage. The abaca industry faces increasing competition from synthetic fibres and other natural fibres. Owing to this, its expansion has not been marked.



Tobacco

The Philippines has been important as a producer of cigar-wrapper tobacco and



cigar-filler tobacco. The production of cigar-wrapper tobacco meets export demands as well as the needs of the Philippine cigar industry. There is also a large production of virginia tobacco for making cigarettes. This is a relatively young industry.

Tobacco is grown in areas with distinct dry and wet seasons. The main areas are mostly in Luzon. Cigar tobacco is produced mainly in the Cagayan Valley; virginia tobacco is grown in the Ilocos coastal areas in the west of North Luzon and also around the Lingayan Gulf and in Laguna province. Roads have been built to the new areas of production, especially La Union province to the east of Lingayan Gulf. Other tobacco-growing areas include Cebu, Panay, Negros and Cotabato in Mindanao.

Although the growing of virginia tobacco is a young industry, the Philippines is among the top tobacco-producing countries of the world. In Asia its production is exceeded by only Communist China and Japan. The tobacco industry supports several million people in Luzon alone.

Livestock

The Philippines has a fairly large livestock

The fishing industry in the Philippines has been expanding rapidly.



and poultry industry. The rearing of cattle, pigs and poultry is conducted on a modern large-scale industrial basis in addition to the small-scale livestock rearing by many rural families. The number of cattle has increased from 400,000 at the end of World War II to more than 1.5 million. Besides, there are 3.5 million buffaloes reared for farm work.

The number of pigs has increased from 3.5 million in 1952 to more than 7 million, but this increase of about 100% is very small compared with the tremendous expansion of the poultry industry. From a total number of 1.9 million poultry in 1952 the number of chickens has increased to about 60 million.

About half the total grassland area of 8.5 million acres is used for extensive cattle ranching. Many modern piggeries and poultry farms have been established. With the general expansion the livestock and poultry industries are able to supply most of the country's needs for beef, pork, poultry and other meat products.

Fishing

The Philippines has a very long coastline of more than 10,000 miles and lies on some of the richest fishing grounds in the world. With these advantages, the fishing industry has been greatly developed, but the total fish production supplies only 70% of the country's needs. The 30% deficiency has to be met by imports from Japan, Korea and South Africa.

The richest fishing ground is in the Sulu Sea, near the Palawan waters. The Visayan Sea is a close second. There are freshwater fishing areas as well as inshore and offshore fishing areas.

With the aim of achieving self-sufficiency in fish production, the Government has launched a Five-Year Production Programme

to develop deep-sea-fishing, fish pond expansion and oyster cultivation. It provides loans to fishermen and encourages technical education in fishery schools. It has enlisted the help of several F.A.O. fishing experts and assistance from Australia and the Netherlands.

There are 8 fish canneries and hundreds of other establishments which make fish products.

Timber

The Philippines ranks as one of the world's leading timber-producing countries. A large part of the country's wealth comes from its "green gold". The exports of logs and sawn timber, plywood and veneer form the second biggest dollar earner among the export commodities, after coconut products.

Several species of "Philippine Mahogany" and Philippine hardwoods constitute the bulk of timber exports. Over 1,000 lumbering licences were issued, and the timber companies produce nearly 8 million cubic metres of logs a year. There are several hundred sawmills and nearly 40 factories producing plywood and veneer.

The main lumbering areas are in the interior of Mindanao and Negros, with considerable production of timber also from Samar and Palawan.

Mineral Resources

The Philippines is fortunate in being well endowed with mineral resources, although much of its mineral deposits remains unexploited. The metallic minerals include gold, copper, iron, chromite, silver, lead, zinc, mercury, manganese, molybdenum, nickel, platinum and cadmium (a metal resembling tin). The non-metallic minerals are coal, rock phosphate, limestone, rock asphalt, asbestos, gypsum, sulphur, mag-



Timber features prominently in the exports of the Philippines. Both logs and sawn timber are exported. The picture shows a timber company with its sawmill and log pond.

nesite, petroleum and natural gas.

Of the metallic minerals which have been exploited, the most important are copper, gold, iron and chromite. The Philippines has the world's largest deposits of chromite of the refractory type, the type that can stand great heat. It is very difficult to melt, and therefore useful for lining blast furnaces and chroming machine parts that have to withstand very high temperatures. The country also possesses some of the richest deposits of nickel in the world. It is the largest gold-producer in Asia and one of the top ten gold-producing countries in the world. Besides, it is one of the few countries where molybdenum, a metal much used as a steel alloy and in electrical equipment, is found.

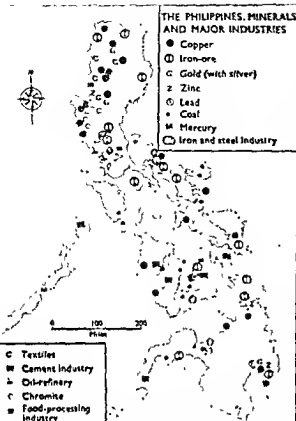
Copper is the leading mineral in terms of export value. It has been the backbone of the mining industry for many years. It accounts for nearly 75% of the total value of the output of base metals. The main producing areas are in Cebu, Western Negros, Mountain Province in Luzon, Samar and Zamboanga del Sur in the south-west of Mindanao.

Gold is the second most important mineral.

THE PHILIPPINES. MINERALS AND MAJOR INDUSTRIES

- Copper
- ⊙ Iron-ore
- ⊙ Gold (with silver)
- z Zinc
- ⊙ Lead
- Coal
- ⊙ Mercury
- ⊙ Iron and steel industry

- ⊙ Textiles
- ⊙ Cement industry
- ⊙ Oil-refinery
- ⊙ Chromite
- ⊙ Food-processing industry



The chief mining area is the Baguio district where the largest gold deposits in the country are located. There are five mines in the district. There is another gold mine in the Paracale-Jose Panganiban district in the northern part of south-east Luzon. Gold is also obtained as a by-product from the copper mines in Cebu, Mountain Province, Davao and Zamboanga del Sur.

Iron-ore production comes mainly from the northern part of south-east Luzon, and partly from Zamboanga del Sur and Davao in Mindanao. Large reserves are also found in Surigao in north-east Mindanao, Samar and the southern part of south-east Luzon.

Chromite, the fourth major mineral, is produced in the Zambales Mountains to the west of the Central Plain of Luzon. In Zambales are found the largest reserves of

refractory chromite in the world. There are in the same area, deposits of the non-refractory type of chromite. There are reserves of chromite in several other areas, too.

Coal deposits occur in considerable quantities in many parts of the country, but production is confined to Cebu and Zamboanga del Sur. It is mostly low-grade coal and is used mainly for making cement and in power-stations.

Silver, lead and zinc usually occur together with gold and copper ores and are produced in the gold mines in the Baguio district and the copper mines in Cebu, Samar, Western Negros and elsewhere. Mercury or quicksilver deposits are plentiful in Palawan which is the sole producing area. There are smaller deposits of mercury on other islands, too. Manganese is produced in Palawan, Bohol and Eastern Negros, while sulphur is obtained from Cagayan province. Some petroleum in Cebu and moderate reserves of natural gas in Luzon have been discovered.

In recent years a number of important minerals not previously produced have been brought to the surface molybdenum, nickel, platinum and cadmium. Molybdenum is mined in Western Negros, while nickel, platinum and cadmium are produced as by-products in the processing of gold and copper ores.

Foreign exchange earned through the exports of copper, gold, iron, chrome and other minerals to Japan, the United States, the United Kingdom and elsewhere, represents a considerable amount in the country's total earnings. The production of many different metals and non-metallic minerals also provides industrial raw materials to meet the increasing demands of consumer industries in the country, e.g. the

iron and steel industry, the cement industry and the chemical industry.

Industries

In the years before and immediately after World War II, there were very few secondary industries in the country, apart from the processing industries of rice-milling, sugar-refining, sawmilling and processing of coconut products, and some cottage industries. But as in most other South-East Asian countries, great progress has been achieved in industrial development during the last fifteen years. The main aim of the Government in promoting industries is to conserve foreign exchange.

Among the earliest industries set up in the 1950's were textile manufacturing, food preserving and processing, and factories producing metal products and wood manufactures, especially plywood and veneer. The industries which were established later included pulp and paper making, cement manufacturing and oil refining.

More recently, however, the emphasis has been on the development of the heavier and more complex basic industries, such as an integrated steel industry, the smelting of aluminium, nickel and zinc, chemical industries and the manufacturing of products

In spite of Philippines' industrial progress, pottery-making is still a common cottage industry.



Mat-making is important amongst the rural population of the Philippines

from non-metallic minerals, e.g. cement, ceramics and glass.

There are over 7,000 industrial units, in the Philippines, two-thirds of which are located in Manila and its suburbs. But the Government is encouraging the spread of industries to different parts of the country so as (i) to prevent undue concentration of population in a few urban centres (ii) to provide additional income to the rural population and (iii) to reduce production costs.

The food preserving and processing industry has seen tremendous growth. It consumes about 30% of the total electrical power output of the National Power Corporation, more than what is consumed by any other industry or group of industries. The country no longer depends heavily on imported food preparations, as there are twenty large food-processing factories turning out dairy products, canned foodstuffs, powdered foods and other food items, and several modern flour-mills producing some million bags of wheat flour a year.

The cement industry has progressed to a



Two aspects of the modern industries in the Philippines LEFT: a petroleum refinery. RIGHT: steel making.

stage where it supplies 99% of the country's rising need for cement in the construction of roads, airports, docks, irrigation works, factories and other buildings.

In the textile industry the majority of the large factories are integrated mills where the spinning, weaving and finishing processes are carried out in the same factories. As the production of textiles grows, the import of fabrics and clothing decreases. This industry has even begun to contribute to export earnings by exporting textiles.

Among the newer industries, the petroleum refining industry is growing rapidly, with four giant refineries which produce petroleum products for home consumption and for export.

The iron and steel industry has not developed sufficiently to cope with the increasing domestic demands. The production from most plants is relatively small. However, an integrated iron and steel factory has been set up at Iligan City in the north of Mindanao to make use of the rich mineral resources of the country. The power needed is supplied from the hydro-electric power

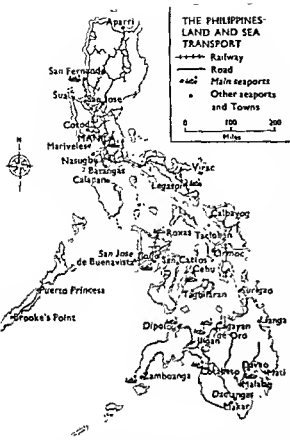
plant at Lake Lanao.

To provide the industrial areas with electric power, the Government-owned National Power Corporation has four major hydro-electric power plants, three of which are in Luzon and supply power for mining and industrial enterprises scattered over Luzon, especially in the Greater Manila area. The fourth plant is at Lake Lanao in Mindanao and supplies energy to the integrated iron and steel industry, as well as the fertilizer and chemical industries in the Iligan area.

The power plants are supplemented by several hydro-electric power stations, steam, diesel and electric plants owned by private firms. About 80% of the total output from Government and private sources is used by industrial consumers.

Trade Exports

The most important exports are (i) coconut products such as copra, coconut oil and desiccated coconut; (ii) logs and sawn timber, plywood and veneer; (iii) sugar; and (iv) metal ores. Other major exports are



however, is neither adequate nor efficient.

The small railway network of 840 miles has been reduced to about 700 miles with the abandonment of the line in Cebu. There are now only two islands with railways, namely, Luzon and Panay. On these islands the railway serves the large areas with heavy concentrations of population based on the cultivation of rice. In Luzon the railway extends northwards from Manila as far as San Fernando in La Union province, and southwards and south-eastwards as far as Legaspi. There is a branch line to Gapan and San Jose on the eastern edge of the Central Plain. On Panay island the railway runs from Iloilo in southern Panay to Roxas in the north. There is no railway at all on

the large island of Mindanao.

Roads

All the main islands have some road systems. There is a total of more than 35,000 miles of national highways, urban roads and provincial roads. This mileage compares favourably with those in other South-East Asian countries. But less than 20% of the total mileage of roads consists of concrete-paved or asphalted roads. The remaining roads are not well surfaced and many become almost impassable during the rainy season.

In spite of the fact that more than 50% of the total road mileage is in Luzon, only Central Luzon is really well catered for. All over the country there is a need for more minor roads to join the outlying parts to the market towns. In the Visayas all the larger islands except Samar have a fairly good road system. In Mindanao only some sections of the highways are all-weather roads.

The Government, however, is constructing several hundred miles of new roads each year. There is also a Pan-Philippine Highway Project being carried out. When completed, it will link Luzon, Samar, Leyte and Mindanao and will extend from Aparri in the north of Luzon to Davao in the south of Mindanao, with ferry crossings connecting the stretches interrupted by the sea.

Shipping

As the country is composed of so many islands, its people must depend to a great extent on sea travel and transportation of goods by ship. During World War II the Philippines lost some 80% of its inter-island fleet. Since then the shipping has recovered slowly from the effects of the war. There is now a fleet of more than 800 vessels engaged in the coastal traffic. Of this

number, some 130 are ships belonging to a dozen shipping companies, while the rest consist of lighters, motor launches and sailboats.

For the overseas trade, Filipino shipping companies operate about 50 steamships or ships, which provide services to Hong Kong, Japan, Canada and all the major ports in the United States.

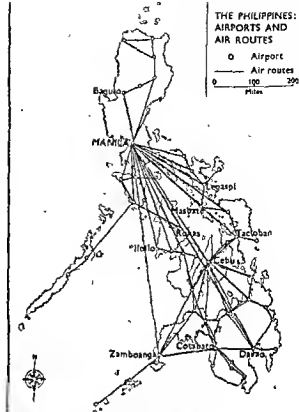
There are about 350 ports which serve the inter-island traffic and 15 ports which cater for the foreign trade.

Air Transport

The Philippine Air Lines, which operates international air services, is not so well developed as the national airlines of some other Asian countries, e.g. Japan, Hong Kong and India. But the internal air services operated by four domestic airlines and many private aircraft are much better developed. In domestic air travel, the Philippines is second only to Japan among the Asian countries in the number of domestic commercial aircraft and the number of private airfields. There are more than 70 national airports and 40 private airfields. In addition, there are 25 secondary airports and 90 minor airports of the feeder class. There are more than 60 commercial aircraft in operation and some 175 privately-owned aircraft used commercially.

Population

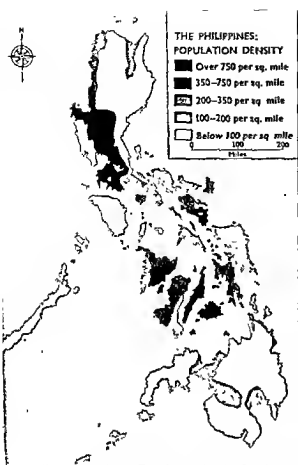
The population of the Philippines is about 35 million. It has increased at a rapid rate from less than 20 million twenty years ago to the present 35 million. The average population density is about 300 per square mile, which is among the highest in the countries of South-East Asia. However, the average density of population does not convey a true picture as the Philippines has a very uneven distribution of people.



Whereas the lowlands are congested with people, the mountainous and forested interiors are almost empty except for a few wandering aboriginal tribes.

The regional population distribution shows that Luzon has the largest proportion of the population — 51.5%. The Visayas together account for 28%, while Mindanao has about 20%. In terms of population densities, the various provinces and areas may be classified in five groups as follows:

1. Very densely populated areas: The average population density in Cebu is the highest, about 1,000 per square mile, with nearly 2,000 per square mile in parts of the island. Luzon as a whole has an average density of 325 per square mile, but in the Central Plain the average density is about



1,000 per square mile even when excluding the urban area of Manila, where the inner core has a density of more than 170,000 per square mile.

2. **Densely populated areas:** Other areas with high population densities of over 350 per square mile are the southern part of south-east Luzon, Bohol and Panay, especially the Iloilo district.

3. **Moderately densely populated areas:** Areas with densities of between 200 and 350 per square mile are found in Western Negros and Leyte.

4. **Less densely populated areas:** These areas, with densities of 100-200 per square mile, include Samar, the southern peninsulas

of Luzon excluding the south-eastern tip, Eastern Negros, Cotabato province, Davao province and the northern coastal areas of Mindanao.

5. **Sparsely populated areas:** The sparsely populated areas with densities below 100 include the remaining parts of Mindanao which have large uninhabited areas but are attracting more people as new roads are opening more land for settlement, the mountainous region in North Luzon, Mindoro, Masbate and Palawan which has an average density of only 40 per square mile and is the most sparsely populated among the larger islands.

The most densely populated areas are those with fairly extensive lowlands where fertile alluvial or volcanic soils enable good crops of rice or maize and cash crops to be raised to support a large population.

Towns

Manila (population over 3 million in the Greater Manila area), the largest city in the Philippines, is situated at the mouth of the Pasig river which flows from Bay Lagoon into Manila Bay. It has a fine natural harbour which is well sheltered from both the South-West Monsoon and the easterly typhoons.

Manila is favourably situated to serve as the outlet for the produce of two fertile regions with different economic products. To the north is the largest and most productive lowland region in the country — the Central Plain of Luzon. To its south and south-east are important areas where the large-scale production of coconuts and abaca is concentrated.

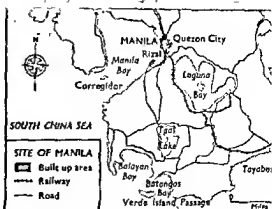
The port of Manila handles about 85% of the import trade of the country. Its export trade, however, is only about 30% of the total export trade of the Philippines. This is

because most of the regional exports are bulky, e.g. metal ores, copra and timber, and are exported direct from the regional ports such as Cebu, Iloilo and Davao.

Manila is the chief air centre of the country. Its airport is one of the busiest and most important in South-East Asia.

Cebu City is the third largest city in the Philippines, after Manila and Quezon City, the capital. The port of Cebu enjoys a central geographical position and handles more of the passenger inflow into the country and a greater share of the inter-island traffic than Manila.

Iloilo, the second busiest Visayan port, is situated in southern Panay. It is connected to Roxas in the north of Panay by the only railway outside Luzon. Its port handles not only the produce of Panay but also the



large exports of sugar from neighbouring Negros.

Davao, the fourth largest city, is the main trading centre and chief port of south-east Mindanao. Its most important exports are shipments of abaca produced in the region. In the north of Mindanao there is another port, Cagayan de Oro, which handles the coastal shipping traffic of northern Mindanao.

EXERCISES

1. With the aid of sketch-maps, show the main features of the physical geography, including climate, of either the Philippines or Indonesia.
2. Write a geographical account of the Philippine Islands.
3. Describe and suggest reasons for the distribution of (a) hemp (abaca), (b) tobacco, and (c) sugar in the Philippine Islands.
4. Study the following information concerning the imports and exports of agricultural foodstuffs in the Philippines in 1953:

Imports	Millions of Pesos value
Grains and grain products	46.2
Dairy products	45.7
Coffee, tea, cocoa	8.8
Other foodstuffs	57.8
Total	158.5

Exports	Millions of Pesos value
Coconut oil and copra	25.7
Dessicated coconut	31.5
Pineapple, tinned	24.4
Sugar	193.8
Total	275.4

- (a) Describe and explain the main features of this import and export trade in agricultural foodstuffs.
- (b) Approximately 40% of the cultivated area is under padi. Why does rice not appear in the list of exports?
- (c) Comment briefly on the non-agricultural imports and exports of the Philippines.

Chapter 15

Burma



The Union of Burma, with an area of 261,789 square miles, is the largest of the countries of mainland South-East Asia. It is bounded on the north-west by India and East Pakistan, on the north-east by China, on the west by the Bay of Bengal and on the south-east by Thailand.

The country, stretching for about 1,300 miles from north to south, lies between latitudes 10°N and 28°N, and its maximum width from east to west is about 560 miles.

Relief and Drainage

Burma is generally a mountainous country with an important central lowland. The series of north-south mountain ranges and uplands surrounding this central lowland tend to isolate the country from its neighbours.

To the north lie the Patkai Hills which reach elevations of over 10,000 feet. These hills extend southwards as the Naga-Chin Hills, where heights range from 6,000–8,000 feet, and the Arakan Yoma, averaging 3,000 feet in height. Together, they form a formidable barrier separating Burma from the Indian sub-continent. This is a remote region of high and rugged relief, a region which has seen very little in terms of development. This has created a tendency to look outwards across the Bay of Bengal and to nearby Assam.

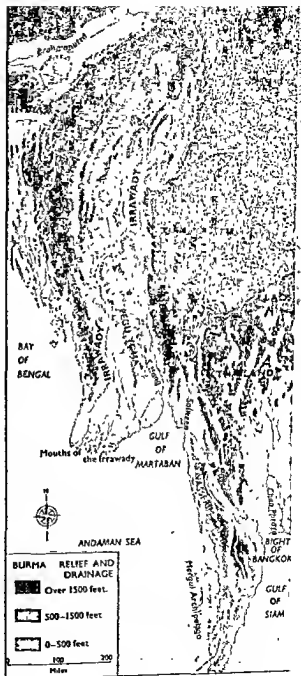
To the east lie the Shan Plateau and its southward continuation into Tenasserim. The Shan Plateau is dissected and heights

of 6,000 feet are reached. But the average height of this upland is 3,000 feet. In Tenasserim much of the plateau character is lost, giving way to serrated ridges running in a north-west - south-east direction.

The Central Lowland, a longitudinal trough, is occupied by the valleys of the Irrawaddy, Chindwin and Sittang rivers. This physical region has long been the centre of Burmese cultural and economic development, although the focus has alternated between the Dry Zone and the Delta region. Essentially an undulating lowland, it is broken by the Pegu Yoma, a low range of hills which runs lengthwise through the middle, and by remnants of volcanic cones associated with the folding of the Pegu Yoma. The grain of the country follows a north-south trend and this has important repercussions on rainfall distribution and the pattern of drainage.

The rivers of Burma flow in a north-south direction following the grain of the country. The Irrawaddy is the major river and, together with its major tributary, the Chindwin, drains about two-thirds of the country. The Irrawaddy rises in the uplands to the north of Burma and, in its 1,250-mile course to the sea, is joined by the Chindwin draining down from the eastern slopes of the Naga-Patkai Hills.

In the east, flowing parallel to the Irrawaddy for much of its course, is the Salween. From its source in the Tibetan Highlands, the Salween drains through the Shan Plateau in a series of deep gorges which limit the navigability of the river. Though potentially important for the production of hydro-electricity, the Salween suffers from the main drawback of great seasonal fluctuations in the volume of discharge. The rivers of Arakan and Tenasserim are short and swift-flowing and are not of great





economic importance.

From the point of view of irrigation and navigation, the Irrawaddy plays a vital role in the geography of Burma. The river is navigable all the year round for nearly 900 miles. As the economic lifeline of the country, the river has attracted the major urban centres to its banks. Some 180 miles from the sea, the Irrawaddy enters its delta region where it branches into many distributaries to form a lattice-work of tiny streams and canals.

Climate

The climate of Burma is of the tropical monsoon type, broadly similar to that of India, although there are some differences. As Burma lies between latitudes 10° and 28° N the northern part of the country beyond $23\frac{1}{2}^{\circ}$ N is outside the tropics. But, like India, Burma is shut off by mountains in the north, so that there is some degree of climatic unity and the country as a whole may be regarded as tropical.

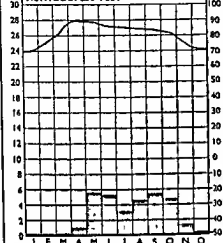
In tropical countries, temperatures at sea level seldom fall below 65° F, even during the cool season. In Burma, the January temperatures in the south are between 75° and 80° F. In central Burma, they are between 70° and 75° F, while farther north they are between 65° and 70° F. The lower temperatures in the mountain region in the far north are not sea level temperatures, yet they do not fall well below 65° F.

In April, the hottest month, all the lowland areas experience temperatures of over 80° F. In the interior Dry Zone, temperatures are much higher, generally about 95° - 100° F and sometimes reaching 105° F as in Mandalay. This is because the interior is far from the moderating influence of the sea. In the uplands and mountainous areas, the temperatures are below 80° F.

PLACE: MANDALAY

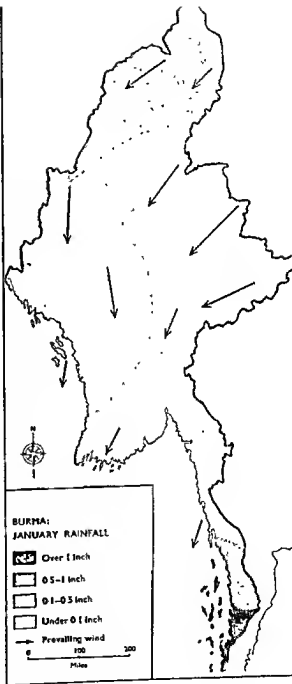
TOTAL ANNUAL RAINFALL: 35 INCHES

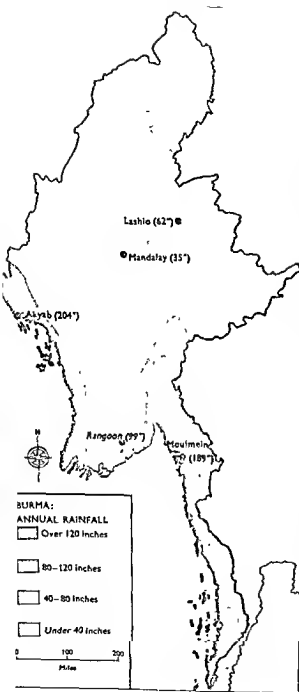
ALTITUDE: 250 FEET



Another feature of the tropical climate is the greater seasonal difference or annual range of temperatures as compared with the equatorial type of climate. The annual range at Mandalay is 20°F.

The climate of Burma is also monsoonal. The monsoonal and maritime influence is most marked during the season of the South-West Monsoon from May to October. The 'burst' of the South-West Monsoon takes place in late May, earlier than in India. The South-West Monsoon winds are attracted to the low pressure area over western China. They are responsible for the very heavy rainfall along the coastal strips, with their maximum during July. The July rainfall at Rangoon is 21 inches out of the annual total of 99 inches. The influence of relief is important, too. The monsoonal air-stream reaches Burma after a long journey over warm seas. It is very moist in its lower layers, and when forced





to ascend, the moisture it contains condenses and falls as rain. Thus it contributes considerably to the large amount of rain falling on the hilly coasts of Arakan and Tenasserim. The greater part of the annual rainfall occurs during the three months from June to August, e.g. at Akyah 146 inches out of the yearly total of 204 inches falls during these months.

But in the interior, the climate during this season is much drier as the air stream has already lost much of its moisture on the Arakan coast and the western slopes of the Arakan Yoma. The Dry Zone experiences marked rainshadow effects caused by the Arakan Yoma. Besides, the descent of the air stream on the eastern or leeward side of the Arakan Yoma has fohn-like effects, that is, warming and drying effects. The annual rainfall in the Dry Zone is generally less than 40 inches a year, with some parts receiving as low as 20 inches. Mandalay's yearly total is only 35 inches.

During the North-East Monsoon season, from late October or November to February, high air pressure is built up over the cold interior of Asia, and even in the northern part of Burma the air-mass tends to sink. Northerly or north-easterly winds blow across the country to the sea, but as these winds originate from the land, there is little rainfall during this season, especially in January and February. Most rainfall stations record only 0.1 to 0.3 inch of rain during January or February. This is a dry and cool season.

In the transitional period from March to May, there is an absence of strong air currents. The interior of Burma gradually gets hotter. April is the hottest month, when the temperature rises to 95-100°F. The ground is baked hard and the vegetation is almost scorched dry.

Place	Lat.	Long.	Alt.	Months													
				J	F	M	A	M	J	J	A	S	O	N	D		
RANGOON	17°N	93°E	350 FT.	78	79	85	87	84	83	81	81	81	82	79	77	10	Temperature
				INS	0.3	0.3	0.4	1.2	12.5	19.2	31.1	19.5	4.4	2.1	0.3	99	Range
																	Annual
AKYAB	20°N	92°E	20 FT.	70	74	80	83	84	83	81	87	82	81	79	71	14	Temperature
				INS	8.1	0.3	0.6	1.9	13.5	41.6	54.1	14.2	2.4	1.1	0.6	364	Range
																	Annual
MANDALAY	22°N	96°E	130 FT.	75	77	84	90	88	87	86	85	82	81	77	72	30	Temperature
				INS	0.1	0.1	0.2	2.1	5.7	5.4	4.8	4.4	5.6	4.6	1.8	31	Range
																	Annual
LASHIO	23°N	97°E	1,800 FT.	60	64	72	75	77	79	77	76	75	72	65	62	10	Temperature
				INS	0.3	0.4	0.8	2.4	4.7	9.6	12.2	17.4	2.7	5.9	2.5	81	Range
																	Annual

CLIMATIC TABLE OF SELECTED STATIONS

Burma may thus be divided into four rainfall regions in terms of annual rainfall. They are:

1. The coastal areas of Arakan and Tenasserim: 120-200 inches.
Examples: Akyab, 204"; Moulmein, 189".
2. The southern part of the Central Belt: 80-120 inches.
Example: Rangoon, 99".
3. The Dry Zone: less than 40 inches.
Example: Mandalay, 35".
4. The rest of the Central Belt and the Shan Plateau: 40-80 inches.
Example: Lashio, 62".

Natural Regions

The country may be divided into three major physical divisions which take the form of three longitudinal belts with a north-south trend. They are (i) the Western Belt, (ii) the Central Belt, and (iii) the Eastern Belt. The Western and Eastern Belts consist mainly of uplands, while the Central Belt consists mainly of lowlands. The three physical divisions may be sub-divided into smaller regions as follows:

1. The Western Belt which comprises
 - (a) The Western Mountains.

(b) The Arakan Coast;

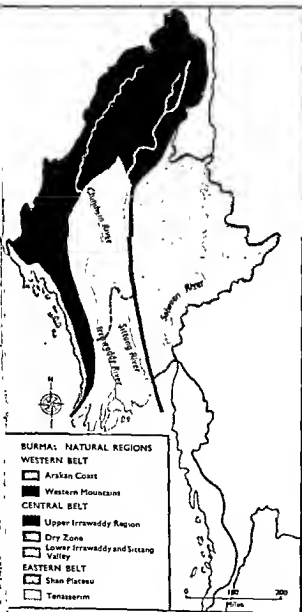
2. The Central Belt which comprises
 - (a) The Upper Irrawaddy Region;
 - (b) The Dry Zone;
 - (c) The Lower Irrawaddy and Sittang Valley Region.

3. The Eastern Belt which comprises
 - (a) The Shan Plateau;
 - (b) Tenasserim.

THE WESTERN BELT

THE WESTERN MOUNTAINS The Western Mountains are a great system of parallel mountain ranges forming a huge arc that stretches from the north of Burma to the south of Arakan. The northern and central parts of this mountain system form a major physical barrier, separating Burma from India and East Pakistan. The southern part of the system separates the Arakan Coast from the rest of Burma. In the north the Western Mountains include the Patkai Hills, the Naga Hills and the Manipur Plateau. The Chin Hills occupy the central part, and the Arakan Yoma the southern part of the Western Mountains. Apart from the northern end of the mountain system, which reaches beyond 10,000 feet, the 'hills' are mostly between 6,000 and

SOUTH-EAST ASIA



10,000 feet in elevation. South of the Chin Hills, the mountain system becomes lower and narrower, finally tailing off beyond the south of Arakan into the Andaman Islands.

There are mountain passes in the northern part of the Western Mountains near Manipur, but there is no major communication route by road or rail between Burma and India or East Pakistan. In the south, a road which has been constructed across the Arakan Yoma provides communication by land between Arakan and the Central Belt of Burma. The road runs from Prome on the Irrawaddy through the Taungup Pass to Taungup on the west coast.

The Western Mountains region is mostly undeveloped and largely covered by natural vegetation. The western parts receive a heavy rainfall of between 120 and 200 inches a year. Except on the higher mountains, the western slopes are covered with evergreen tropical forests. But the eastern slopes, facing the central lowlands, are drier, having an annual rainfall of between 40 and 80 inches. They are covered with mixed deciduous forests, from which teak, ironwood and other useful timber are extracted.

Population densities in this area are very low. Hill tribes of the Chins, Nagas and others practise shifting agriculture, growing hill rice, maize, millet, sweet potatoes and sugar-cane. Some cattle, as well as pigs and chickens, are reared.

THE ARAKAN COAST is a narrow rocky coast consisting of a number of small patches of lowland separated by hills which often reach the sea as cliffs. Most of the lowland areas are small deltaic alluvial plains built by rivers. The largest of these is around Akyab, the main town. This region, especially the area north of 18°N latitude, is cut off from the other parts of the country by the Arakan Yoma

The coast of Arakan is a drowned coast where the longitudinal hills and ridges became islands and rocky peninsulas, and the submerged valleys became gulfs or estuaries. The coast is thus greatly broken, especially in the north where there are many long peninsulas, off-shore islands and gulfs. There are longitudinal ranges parallel to the coast, which make communication with the interior difficult. With the presence of numerous sheltered gulfs and bays, there are many good natural harbours. Because of the difficulty of transporting goods across the longitudinal ranges and the smallness of the coastal plains, no important ports, except Akyab, have developed.

There is very heavy rainfall during the South-West Monsoon season. An annual rainfall of 200 inches is common. Heavy downpours often result in flooding, and swampy conditions are common, especially in the central section of the coast.

The population density of the Arakan Coast is low. Most of the people live in the northern half of the region. The largest concentration of people is in the hinterland of Akyab. Akyab, the chief port and largest town, is situated on an off-shore island in the northern part of the coast. The alluvial lowland in its hinterland is the largest and most fertile and productive of the lowlands along the whole coast.

The main occupation of the Arakanese is the cultivation of rice which is grown on nearly all the cultivated land. Their second most important occupation is fishing. Their subsidiary occupations are the growing of cotton and tobacco, and the extraction of timber.

The main industry is rice-milling, which is centred at Akyab. Other industries have also been established, especially in the newly developed industrial area located in the

north at Ponnagyun, not far from Akyab. The industries include the making of paper from bamboo-pulp and the manufacture of chemicals. The industries are based on the power from nearby waterfalls to the north-west of Ponnagyun.

Apart from Akyab, there are three minor ports of some importance. The largest is Sandoway, lying about halfway along the coast. North of it is Taungup which is connected with Prome by a road across the Arakan Yoma. A coastal road links Sandoway to Taungup and extends some distance north of Taungup and south of Sandoway. At the northern end of the large Ramree Island, the port of Kyaukpyu has been developed in recent years. An air service connects Kyaukpyu with Akyab and Rangoon.

Although there is a road across the Arakan Yoma now, the Arakan Coast is still relatively isolated from the rest of Burma and communication is mainly by sea.

THE CENTRAL BELT

The Central Belt of Burma consists of a great longitudinal trough or depression between the Western Mountains and the Shan Plateau. The northern end of the trough is partly enclosed by a horse-shoe arrangement of highlands. The trough as a whole slopes gently from the north to the south. It is a great undulating lowland floored with alluvial deposits laid by the Irrawaddy, Chindwin and Sittang river systems. Although it is mainly a lowland, it is not as flat as the Gangetic Plain, for its surface is broken by several hill ranges, such as the Kumon Range in the north and the Pegu Yoma in the south, between the Sittang and Irrawaddy rivers.

The Central Belt is the most important physical region of Burma, as it contains

the most extensive and fertile lowlands in the country. The Irrawaddy serves as the most important route-way in Central Burma. In the rainy season, the river overflows its banks and the floodwater extends several miles on each side. The silt spread over the land replenishes the fertility of the soils.

THE UPPER IRRAWADDY REGION This northern region of the Central Belt comprises the basin of the upper Irrawaddy and its head-streams and the upper valley of the Chindwin river and its tributaries. It is bordered on the west, north and east by a mountain wall with a horse-shoe shape. The region slopes southwards from the mountain wall. The relief gradually changes from the forested mountains in the north to lower longitudinal hill ranges and fertile valleys in the south.

The region as a whole is inaccessible, undeveloped and very thinly populated. In fact, large areas are almost uninhabited. On the northern forested mountains the Kachins, Shans and other hill tribes live in jungle clearings and practise shifting agriculture. But towards the south, sedentary agriculturalists, mostly Burmans, grow rice in the fertile valleys and also cultivate maize, soya beans, tobacco and vegetables. It is from this northern region that the famous 'Chinese jade' was mined and sent to China during the past centuries. Some jade is still being worked in mines near Myitkyina. A more important mineral in the region is coal, deposits of which are worked at Kalewa in the south-west border of the region.

The chief towns in the region are Myitkyina, Bhamo and Katha. Myitkyina is the northern terminus of the railway from Rangoon.

THE DRY ZONE This region, lying mostly between latitudes 19° and 23°N, consists of the middle basin of the Irrawaddy and the lower

valley of the Chindwin. It is an undulating lowland which is fairly densely populated and extensively cultivated. The soils are, on the whole, of only moderate fertility as there are large areas of light sandy soils, as well as areas of black cotton soils and fertile alluvium.

Most of the region falls within the 40-inch isohyet. The low rainfall is due to the fact that the region lies in the rains shadow of the Western Mountains. The total annual rainfall of Mandalay is only 35 inches. In some parts of the Dry Zone, the rainfall is as low as 20 inches a year.

With its low annual rainfall, its light and porous soils in many areas and its intense heat and high rate of evaporation during the hot months from April to September, the Dry Zone does not seem to be a favourable region for agricultural development. Yet it became the heart-land of Burma and is one of the two main agricultural regions in the country.

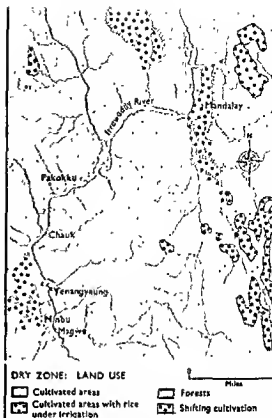
One explanation for this anomaly is that the Burmans, who came from the hills and mountains of the north, found this lowland region the best in the country for their methods of agriculture. They had been used to more unfavourable agricultural conditions in the north. They were not familiar with or able to tackle the densely forested swampland of the delta region in the south with its violent floodwaters during the rainy season. The Dry Zone was the first extensive lowland area to be settled by the Burmans, who found the open vegetation easy to clear and the light soils easy to work. In the course of several centuries, they have successfully developed a varied and diversified agriculture in the Dry Zone.

The relatively flat and low terrain and the variety of soils in the region are suitable

for the cultivation of a variety of crops in smallholdings. The dry climate is an advantage, for more types of crops can be grown than in the flooded Irrawaddy delta. Even wet rice can be grown with the help of irrigation from small tanks and wells. Water is also obtained from irrigation canals of the inundation type. There are three old irrigation systems which have remained in use to this day. These canal systems were improved by the British and the Burmese Government. Several modern irrigation projects providing perennial irrigation have also been constructed and others are under construction. These modern projects have been undertaken mainly to improve the cultivation of rice and to extend the rice-growing areas and partly to enable farmers to produce a second crop of rice during the dry season. Although rice cultivation in the Dry Zone is not so important as in the delta region in the south, within the Dry Zone itself, rice is the main food crop, occupying about 35-40% of the cultivated area. The total acreage under rice, both the wet and dry types, is more than 2 million acres.

Another food crop is millet. This grain is not such a favoured food as rice, but it is suited to the dry conditions and light soils of the region. Its total acreage varies a great deal from year to year. In drier years it is an important food crop, as it is a dependable crop should the unirrigated rice crops fail.

Other crops well suited to the arid climate and light soils are the deep-rooted sesamum and groundnuts. They occupy 1.5 and 1.3 million acres respectively. They provide the main cooking oils and also yield an income as cash crops. The chief groundnut-growing areas are the Mandalay District and the Magwe District, nearly 150 miles to the south-west of Mandalay. Soya beans and



other beans and pulses, which occupy a large area of 1.4 million acres, are grown for local consumption, while cotton is an important cash crop in several areas, especially those with black cotton soils. The main cotton-growing areas are in the east-central and southern parts of the Dry Zone.

Although millet, groundnuts, sesamum and cotton are grown elsewhere, they are distinctive crops of the Dry Zone and their cultivation is concentrated largely in this region.

Another economic activity distinctive of the Dry Zone is the breeding and rearing of cattle. Cattle are reared in large numbers as draught animals for agricultural work in the region and also for sale to other parts

of the country.

Petroleum is the main mineral product of the Dry Zone. A line of oilfields extends along a stretch of the middle Irrawaddy from Sabe (south-west of Pakokku) to Minbu. The main fields are at Chauk and Yenangyaung. There is an oil refinery at Chauk. The annual output of oil is 166 million gallons. There is a pipeline which carries crude oil to two oil refineries at Syriam, near Rangoon.

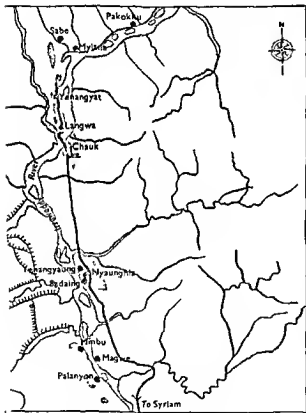
The chief towns of the Dry Zone are river ports which enjoy easy communication and

transportation by river. The most important town is Mandalay, a former capital of Burma. Two railways serve the region, one running along the Irrawaddy Valley and the other by way of the Sittang Valley. **THE LOWER IRRAWADDY AND SITTANG VALLEY REGION** The southern region of the Central Belt consists of the lower Irrawaddy plain and the valley of the Sittang river, separated by the low hill range of the Pegu Yoma. This is an extensive lowland region with a heavy annual rainfall of between 80 and 120 inches. The lower Irrawaddy plain, which includes the delta, forms a great triangular area which measures some 180 miles from its apex near Prome to the sea and some 150 miles at its coastal base. This vast plain is drained by a large network of distributaries and creeks, with nine main outlets to the sea.

The land is flat and very low-lying, mostly a few feet above sea level. More than 15% of it is below the level of the highest tides. The Irrawaddy and its distributaries, on the other hand, flow at a higher level than the fields on either side. The height of the levees on the sides of the rivers has to be continually increased and embankments or dykes have to be built to prevent severe flooding and damage to the crops.

Between the lower Irrawaddy plain and the Sittang Valley farther east lie the relatively small lowlands of the Hlaing and Pegu Valleys. It is at the confluence of the Hlaing and Pegu rivers that Rangoon stands. The combined lowlands of the lower Irrawaddy plain, the Hlaing and Pegu Valleys and the Sittang Valley form one vast rice-growing region which is the great granary of the country and one of the 'rice-bowls' of Asia.

On the fertile alluvial soils of this region, wet rice is cultivated partly as a cash crop and partly as a subsistence crop. Rice is



CENTRAL BURMA. LOCATION OF OILFIELDS

— Oil pipeline

Oilfields

Refinery

Canal

0 25 Miles

the only crop, and its cultivation is termed 'monoculture'. The marshy terrain and wet climate do not suit other crops such as those grown in the Dry Zone. The large-scale monoculture of rice results in the production in this region of about two-thirds of Burma's total rice output.

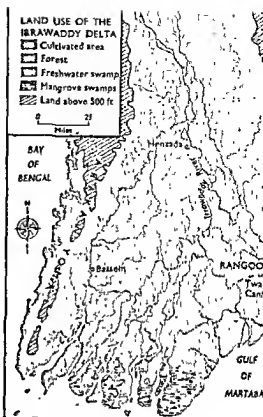
In this wet region, rice is not an irrigated crop. It is mainly a 'rain crop' dependent on the monsoon rainfall. One of the farmers' main problems is to keep out floodwater from the rivers. The dykes along the river banks and the bunds along the sides of the rice fields serve this purpose. The bunds also serve to keep the rainwater inside the fields when it is necessary to do so. But keeping out floodwater also means keeping out the enriching silt brought by the rivers. This in turn results in the need to use artificial fertilizers to enrich the soils, especially if higher yields are to be obtained.

The cultivation of rice enables this region to be the most densely populated in Burma and also the most important economically, as it provides the largest share of the country's leading export commodity, namely, some 1½ million tons of cleaned rice a year.

The only large town in the Irrawaddy delta proper is *Bassein* (78,000). It is an important rice-port and has large rice-mills. As a river-port, it is situated well inland on the western side of the delta.

Rangoon (825,000) is the capital and chief port of Burma. It is not situated in the delta but to the east of it, occupying a commanding position between the delta on the one hand and the Sittang Valley on the other. It handles more than four-fifths of Burma's external trade and is also the most important industrial centre in the country.

The main towns in the fertile and densely populated Sittang Valley are *Pegu* in the



south and *Toungoo* in the upper part of the valley.

THE EASTERN BELT

THE SHAN PLATEAU The Eastern Belt of Burma consists of the Shan Plateau and its southern extension into Tenasserim. The western edges of the Shan Plateau rise sharply from the Irrawaddy-Sittang lowlands. Most of the huge plateau surface ranges from 3,000 to 6,000 feet in elevation. The Shan State occupies the greater part of the plateau, and its inhabitants are mostly Shans. The plateau has an undulating surface broken by folded longitudinal or north-south ranges rising above the plateau level.

The main river draining the Shan Plateau

is the Salween which is a larger river than the Irrawaddy, but of little importance as compared with the Irrawaddy. It flows through a deep and rocky trench-like valley, sections of which form a series of very deep and long gorges. The Salween Valley as a whole may be regarded as the longest canyon in the world. Other unfavourable features are the many rapids along its course and the great seasonal changes in the level of its water. No true delta has been built at its mouth which is badly silted and of little use for navigation. The shifting sand-bars at its mouth cause frequent changes in the courses of the distributaries. All these features render the river of very limited use for navigation. Because of these drawbacks and the absence of extensive lowlands along its valley, the huge area drained by the Salween offers little attraction to settlement and agriculture, and no large settlement clusters have developed. The main use of the Salween is for floating teak logs to Moulmein.

The Shan Plateau on the whole has rugged and broken relief which presents great difficulties to communications, especially in an east-west direction. The population on the plateau is sparse, except in some fertile patches and important mining areas. In the northern part of the plateau, the population densities are between 25 and 75 persons per square mile, but in the southern and eastern parts, the densities are below 25 persons per square mile.

Both types of agriculture — shifting and sedentary — are practised. Sedentary agriculture, especially on the terraced slopes of valleys, is relatively advanced. Owing to the cool climate, sub-tropical cash crops such as tea, potatoes, fruits, vegetables and flowers are grown, mainly for sale in Rangoon and other large towns. Some rice is cultivated

in the more low-lying areas which are sheltered and warmer than the uplands. In the more remote uplands, shifting cultivators grow hill rice, maize, yams and millet. The growing of tung trees is a distinctive form of commercial agriculture. The nut of the tung tree yields an oil which is next in importance to linseed oil in the manufacture of paint, varnish and enamel.

The Shan Plateau is relatively important in mineral resources. Rich deposits of silver and lead are worked at the Bawdwin mines to the north-west of Lashio. Smaller quantities of zinc, copper and nickel are also produced at Namtu. In the Hsipaw area to the south-west of Lashio, deposits of gypsum ore have been discovered and will be worked to produce gypsum for manufacturing cement and fertilizers. In Kayah State, which lies to the south of the Shan State, some tin and wolfram are produced in the Loikaw District.

The Shan Plateau is served by some good roads and two branch railways, one to Lashio and the other to Taunggyi at the north of the famous Inle Lake. Regular air services link Lashio and Loikaw with Mandalay and Rangoon respectively.

TENASSERIM The western ranges of the Shan Plateau narrow southwards and continue towards the Kra Isthmus as the Tenasserim Range. Tenasserim, the most southerly region of Burma, is a long and narrow territory, more than 500 miles in length. It consists of a series of roughly parallel ranges edged by a narrow coastal plain. The Tenasserim ranges are longitudinal ranges slightly askew to the coast instead of being strictly parallel to it. On reaching the coast, they continue out to sea as off-shore islands.

The Tenasserim coast has a broken coastline like that of Arakan. It is rocky in

places where the ranges and spurs reach the sea. There are hundreds of off-shore islands, especially at Mergui Archipelago. Many of the islands are hilly, being former hills or mountains which have been drowned.

The annual rainfall is very heavy as at the Arakan coast, but as Tenasserim is nearer the equator, the rainfall is more evenly distributed throughout the year and the high temperatures are more uniform with less seasonal differences. This climate suits the growing of rubber, which is cultivated in a number of plantations established on well-drained land some distance from the coast.

Rice is, however, a far more important crop. It is grown in all the small areas of alluvial lowland along the coast. In the north, the alluvial lowland around Moulmein is the largest and most important rice-growing area in Tenasserim. Along the extensive coast, fishing is another important occupation of the coastal dwellers. The extraction of teak and other timber and the production of coconuts are other subsidiary occupations.

Mining is relatively important, as there is much mineral wealth. There are many scattered deposits of tin and tungsten. The mining industry, however, is not well developed. The main mining areas are around Tavoy and Mergui. Tin is obtained largely from the district south of Mergui. Tungsten ore is mined mainly in the valley of the Tavoy river.

Moulmein is the largest town in Tenasserim and the third largest in the country. Tavoy, almost halfway along the coast, is the port serving the main tungsten-producing area in Tenasserim. Ye, a small town south of Moulmein, is the terminus of the railway from Rangoon and Pegu. The railway serves only a small stretch of the coast, and the main coastal communication is by sea.

Primary Production

AGRICULTURE

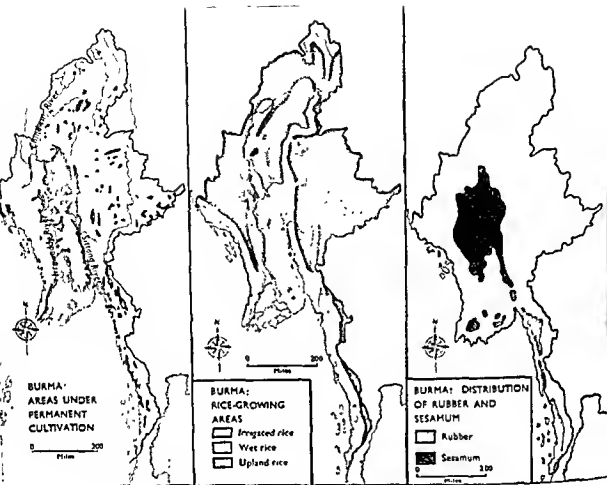
A look at the principal exports of Burma and their total value would reveal that agricultural produce such as rice, oilcake, beans, cotton and rubber take up seven-eighths of the total value. The other one-eighth of the total value of exports comes from non-agricultural produce (timber and metals or metal ores).

Burma is essentially an agricultural country. Some 63% of the total labour force of the country is engaged in agricultural work. But in terms of value, the total output of agriculture (not merely exports) has now been exceeded by the national output of manufactured products.

Only about 13% of the total land area of Burma is arable land or land that can be put to agricultural use. The total cultivated area is about 22 million acres, of which the greater part is located in the Irrawaddy Valley, the Sittang Valley and the Chindwin Valley. Other smaller agricultural areas are the northern part of the Arakan Coast, the northern part of the Tenasserim Coast and parts of the Shan Plateau.

In the Irrawaddy delta, lower Sittang Valley and in northern Arakan and northern Tenasserim, the rainfall is adequate for growing wet rice, but in the other areas of cultivation, especially in the Dry Zone, wet rice is grown with the aid of irrigation water, while other crops are 'dry' crops which depend mainly on rainwater. The proportion of irrigated land is not high, only 2 million acres, or less than 9% of the total cultivated area of 22 million acres.

A large number of major irrigation works (some two dozen of them) have been completed. The largest dam is in the Myingyan District in the centre of the Dry Zone, south-west of Mandalay. Most of the



irrigation works are located, as expected, in the Dry Zone. Many of the works enable the farmers to double crop wheat, pulses, maize, cotton and groundnuts. The largest project is the Sittang Valley Scheme which provides irrigation water as well as flood control over 2.4 million acres in the districts of Toungoo and Pegu and other districts in the Sittang Valley.

Rice, the principal food crop, is grown both as a subsistence crop and as a cash crop. It is cultivated where sufficient rainwater or irrigation water is available. The crop occupies some 13 million acres or about 60% of

the total cultivated area of 22 million acres. It is the chief crop in the lower Irrawaddy plain, the Sittang Valley, and the north Arakan and north Tenasserim coasts, all areas with sufficient rainfall. The total amount of rice produced is more than 7½ million tons a year, but owing to the growth of the population, the total rice exports of between 1½ and 2 million tons a year is much less than the pre-war annual exports of 3 million tons.

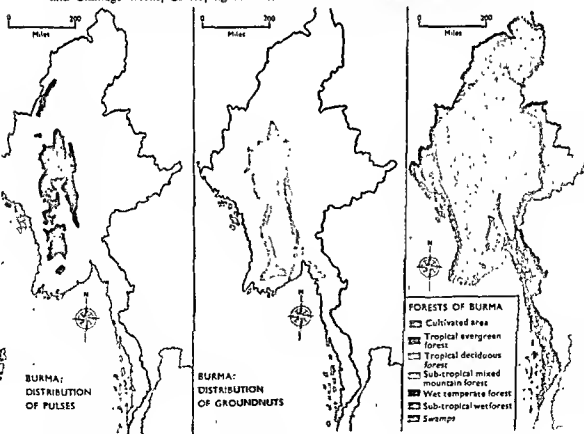
Other important crops are *sesamum*, beans and groundnuts. These crops and also the less important crops of cotton.

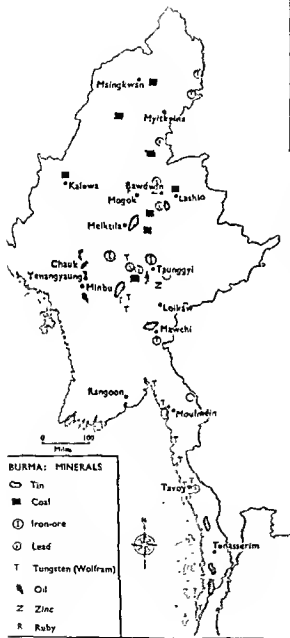
wheat and millet are grown mainly in the Dry Zone, but their cultivation has spread to many areas on the Shan Plateau. Other crops of some importance are maize, tobacco, sugar-cane and the fibre crops of jute and kenaf. These are cultivated in various parts of the country and not concentrated mainly in the Dry Zone. Rubber is the second most important crop in Tenasserim, especially in the Tavoy and Mergui Districts where the wet season is the longest in Burma. The annual production is only about 13,000 tons.

The annual output of 13 of the 18 principal agricultural products has dropped considerably. But the Government has taken active steps to promote greater production by constructing and improving irrigation and drainage works, developing and dis-

tributing better strains of plants or seeds, reclaiming and restoring poor agricultural land, organising fertilizer distribution schemes, encouraging mechanisation and giving loans to farmers. It is making an all-out effort to increase the acreage of several crops to achieve self-sufficiency. One of its main aims is to reduce the imports of agricultural products such as sugar and raw cotton.

Except in the Dry Zone, the rearing of livestock is a minor agricultural occupation. Water buffaloes are reared in the wet delta zone, but other types of cattle are reared in the drier areas for agricultural work such as ploughing and pulling carts, and even for hauling timber logs. In the Dry Zone, several million heads of cattle are reared





and a large number of them are sold to other parts of Burma. Other animals that are reared are pigs and goats.

FOREST PRODUCTS

Forests cover about 58% of the total area of Burma. Of the total forested area, about 30% is occupied by teak trees which are found in mixed deciduous monsoon forests. Such forests occur in areas with an annual rainfall of 60-80 inches, especially on the drier hill slopes in interior locations. Ironwood is another product of the mixed deciduous forests which yield commercial timber. Ironwood is a very heavy and strong timber useful as railway sleepers and for heavy construction work.

The main areas of deciduous forests are the Pegu Yoma area, the Chindwin Valley, the Mu Valley (between the Chindwin and the Irrawaddy) and parts of the upper Irrawaddy Valley.

Burma is the world's leading producer and exporter of teak wood. Its exports of teak supply about 70% of the world teak market. It used to export much more teak, but the exports have declined to about 165,000 tons a year. Some 670,000 tons of ironwood and other timber are produced each year, but they are mostly consumed locally and only a few thousand tons are exported.

In spite of the importance of Burma's sale of teak in the world market, teak is actually only a poor second to rice among the country's main export commodities. It contributes only 10-15% of the total value of all exports, as compared with 60-70% in the case of rice and rice products. Steps are being taken to expand the production and exports of teak and other hardwoods, partly by encouraging the use of cheaper jungle wood in furniture making and light

factory; (v) a silk reeling and spinning factory using locally-produced silk from silkworms fed on leaves of mulberry trees grown in various areas; (vi) wood manufacturing factories (plywood and veneer) along the coast; (vii) a second refinery at Syriam; (viii) several modern rice-mills in and near Rangoon; and (ix) jute-factories at Thamaing, using Thai jute and kenaf to manufacture gunny bags some 32 million of which are produced.

Besides the steel plant near Rangoon, there are modern engineering works where spare parts and accessories for the rice-mills and jute-mills, as well as minor iron and steel products, are manufactured.

The second most important industrial area is centred on Myingyan in the centre of the Dry Zone. The town is situated on the Irrawaddy some 60 miles south-west of Mandalay. This industrial area is within reach of (i) the oilfields, (ii) the coalfields at Kalewa, and (iii) the hydro-electric power station in Kayah State. The industries established in the Myingyan area include the smelting and refining of zinc, chemical industries and cotton textiles.

The third industrial area is in the north of Arakan, where local bamboo is used to manufacture bamboo-pulp and paper, and a chemical plant has been set up at Ponnagyun, near Akyab. The industries use power from nearby waterfalls.

Many new factories have been established in various other parts of Burma. Among them are two sugar-mills in the north, one at Namtu in the Myitkyina District and another at Bhamo. There are new cotton factories at Mandalay, a cotton-growing area. There are also many new rice-mills at various places, which bring the total number of rice-mills in the country to about 2,300. There are also more than 100 factories

and workshops producing aluminium ware.

Of all the industries, the textile industry is by far the most important. About 100 million kyats' worth of cotton yarn is imported each year to feed the modern factories and the 150,000-odd traditional handloom weaving centres throughout the country. In and around Rangoon, there are more than thirty factories producing nylon and rayon, some 150 factories turning out cotton vests and many others producing towels, blankets and rugs.

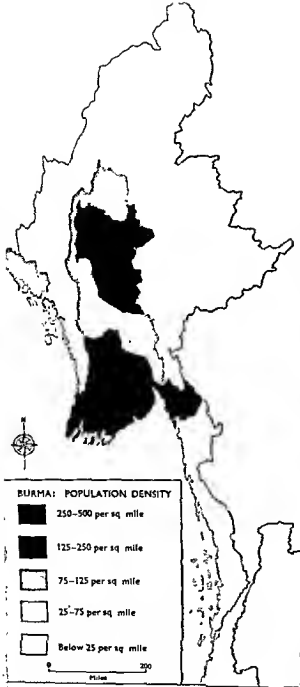
To supply power to the factories in the industrial areas and to mines and irrigation works, several large power-stations have been constructed. Of these projects the most important is the hydro-electric plant at Bala Chaung near Loikaw in Kayah State. This plant supplies electricity to central Burma, the mining centres on the Shan Plateau, and also to Rangoon and its suburbs. Its power is supplied to about 100 towns and 230 villages, and its capacity is being expanded.

Finally, it should be noted that many industries are now operated by the State, as the Government of Burma is a Socialist one.

Trade

Exports

The pattern of the external trade of Burma has been little changed since independence. The main exports are rice and rice products, which account for 60-70% of the total value of all the exports. The chief customers of Burmese rice are Indonesia, Ceylon, India and Pakistan. The amounts bought by these countries vary a great deal from year to year, depending on the yearly rice harvests in these countries. Other large buyers are mainland China, the Philippines, Malaysia, Japan and some East European countries.



the remaining areas of the Central Belt, except the Upper Irrawaddy Region in the north. Such densities are also found in the narrow alluvial plain around Akyab.

The northern part of the Shan State and Tenasserim are regions of sparse population, with densities of 25-75 per square mile. The regions with very sparse population, with densities of less than 25 per square mile, are the Western Mountains and the southern and eastern parts of the Shan Plateau.

Towns

The towns of Burma are mostly small ones, and only Rangoon and four others have a population of more than 50,000.

Rangoon (825,000) the largest city and capital of Burma, is situated to the east of the Irrawaddy and not on the Irrawaddy itself. It is sited at the confluence of the Hlaing river and the Pegu river, which join together, south of Rangoon, to form the Rangoon river. Rangoon thus stands at the head of an estuary some 21 miles from the sea.

Rangoon is the gateway into Burma. It is the chief port for ocean shipping and is also the only city with an international airport. Its position between the Irrawaddy delta and the lower Sittang Valley enables it to control movement along both these river valleys. Its position to the east of the Irrawaddy instead of being on the main river is an advantage, for the mouth of the Irrawaddy is subjected to much silting and severe seasonal floods. But Rangoon is well connected with the Irrawaddy and its delta by a canal. This is vital for the collection of rice which is the main export of Rangoon and forms the basis of its chief industry, rice-milling. This canal also enables Rangoon to serve as the southern terminus of the great inland water-borne

traffic along the Irrawaddy, the principal transport route in the country.

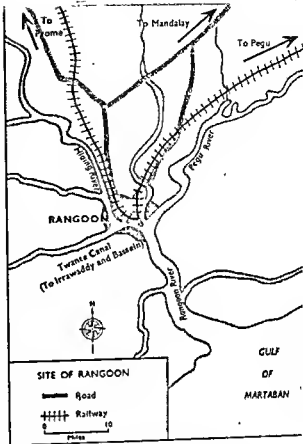
Rangoon is also linked with the Sittang river by a canal, which joins the Pegu river and the Sittang river. The city thus commands the movement along both the larger valleys of the Irrawaddy and the Sittang and the smaller valleys of the Hlaing and the Pegu.

The road and railway systems of the country begin at Rangoon, fanning out northwards to the rest of Burma. Thus the inland waterways, the road and rail traffic, the coastal and ocean shipping and also the internal and external air routes all focus on Rangoon. But as an ocean port, Rangoon suffers from two disadvantages. First, it lies off the main sea-routes used by most large ocean-going ships. Secondly, its harbour is only deep enough for ships with a draught of 30 feet or less.

In spite of this, Rangoon handles about 90% of the import trade, 70% of the export trade and some 50% of the coastal trade. The rest of the coastal trade is shared among Bassein, Mergui, Akyab and Moulmein. Bassein also handles much export trade in rice.

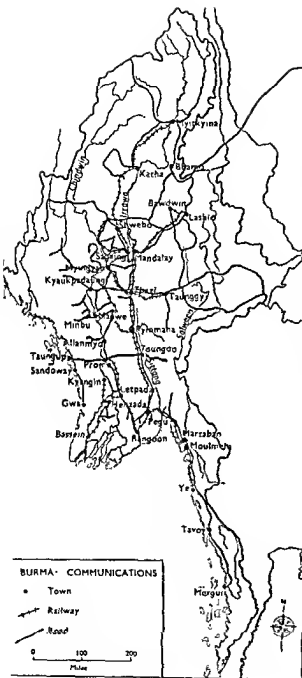
The port of Rangoon has 15 miles of anchorage along the river and 4 miles of wharves. There are 12 wharf berths, three of which are reserved for the rice traffic. The port has equipment for the mechanical handling of cargo. But there is a tendency for the harbour to be silted. Therefore, regular dredging has to be carried out alongside the wharves and jetties.

The chief exports and imports of Rangoon are more or less similar to those of the country as a whole. Rangoon is also the chief industrial centre of Burma, and almost all the secondary industries in the country are represented in the city.



Mandalay (215,000), the second largest city of Burma, is situated on the Irrawaddy near the part of the river where it makes a great bend to the west. As a former capital of Burma, Mandalay is the centre of Burmese culture and tradition. It has long been the focus of economic life in the Dry Zone, serving as the great market centre for the varied products of the region. It stands on the main railway from Rangoon to the north, and is served by a huge bridge, the Ava bridge, which carries a road and the railway. The Ava bridge is the only bridge spanning the Irrawaddy.

There are numerous industries in Mandalay, including small cottage industries and large modern ones. Among the cottage



industries are the handloom weaving of cotton textiles, oil-seed crushing and the making of cheroots and umbrellas. The modern industries include textile manufacturing, milling and brewing industries.

Transport

Railways

The total length of railways in Burma is only some 2,300 miles. This is inadequate for a country which is the largest in mainland South-East Asia. The railway system radiates from Rangoon. The main line runs from Rangoon up the Sittang Valley to Mandalay, and then northwards to Myitkyina in the far north. From Thazi, some 80 miles south of Mandalay, a branch line goes westwards to Myingyan, and another branch line goes eastwards to Taunggyi. From Mandalay a branch line links Lashio and Namtu with the main line, and another runs north-westwards to the Chindwin area.

Another important railway runs from Rangoon to Prome on the Irrawaddy river, with a branch line which serves the towns of Henzada and Bassein in the delta region.

A southern line runs from Rangoon to Moulmein and Ye in Tenasserim.

Roads

There are some 19,000 miles of roads in the country. Of the total mileage, only about one-third, or 6,850 miles, are surfaced roads. In addition there are 60,000 miles of mule tracks, cart tracks and village tracks. Like the railway system, the road system fans out from the capital to the rest of the country. The main trunk road runs from Rangoon almost parallel to the main railway to Mandalay and Lashio, from where there is road connection with Myitkyina in the north.

From Mandalay a road leads northwards to Shwebo and another runs north-westwards to the Kalewa coalfields on the Chindwin.

Farther south, a road joins Thazi with Taunggyi on the Shan Plateau. This road continues right across the plateau to its eastern border. Yet farther south, another road leads from Toungoo to the Mawchi mining area in Kayah State.

Another important road joins the capital with Prome and other towns on the Irrawaddy, including the oilfield towns of Chauk and Yenangaung, and on to Myingyan. A road to Tenasserim serves the coastal towns of Moulmein, Ye, Tavoy and Mergui. There is also a 110-mile road across the Arakan Yoma linking Prome on the Irrawaddy with Taungup on the Arakan Coast.

Water Transport

The inadequate railway and road systems of Burma are partly compensated by a good system of inland waterways. There are some 4,000 miles of commercially navigable waterways which carry a large volume of passenger and freight traffic. The waterways are also useful for floating down teak logs to the sawmills.

The Irrawaddy is a great communication artery. In its delta region there are about 2,000 miles of waterways. The dense network of distributaries and smaller streams here serve many areas not accessible by road or rail. The Irrawaddy is navigable for nearly 900 miles as far as Bhamo, and is used by 500,000 small river craft as well as a large fleet of more than 250 government-owned passenger steamers, heavy freighters and other big river boats.

The Chindwin is navigable for about 400 miles from its confluence with the Irrawaddy for about 8 months of the year. The Sittang is navigable for only about 25 miles for nine months of the year and for 30 more miles during 3 months of high water. The Salween is usable by only small craft for about 60 miles from Moulmein. This river, like the other major rivers, is also used for floating down teak logs to the sawmills at Moulmein.

Air Transport

There are 32 towns with airfields or landing strips. The Union of Burma Airways operates a network of air services covering these towns. It also provides external air services to Calcutta, Chittagong, Bangkok and Phnom Penh.

EXERCISES

1. Draw a sketch-map of the Dry Zone of Burma to show its location and two important towns. Give an account of agriculture in the Dry Zone.
2. (a) Draw a large sketch-map to show the relief and drainage of Burma.
(b) Describe and explain the importance of rivers to Burma.
3. With the help of a sketch-map, describe the main features of the physical geography of Burma.
4. Describe and account for the distribution of population in Burma.

Chapter 16

Thailand

Thailand, the northern neighbour of West Malaysia, has a total area of 198,465 square miles. It is the second largest country in mainland South-East Asia, next to Burma. Thailand is also broadly similar to Burma in climate and in an economy that is geared mainly to the production of rice and teak.

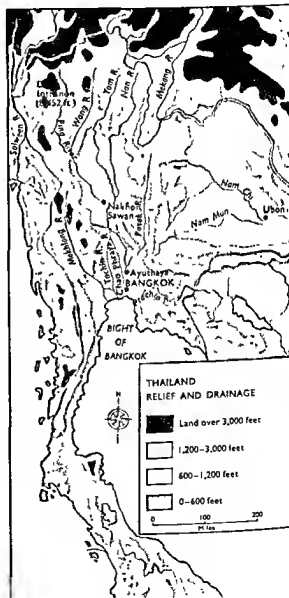
There are, however, certain differences between Thailand and Burma. The uplands of Thailand are lower and occupy a smaller proportion of the country's total area. Thailand is poorer in mineral resources and depends more on agriculture. Climatically, Thailand is nearer the equator and is more sheltered from the South-West Monsoon. It has a drier climate, except in the southern part of Peninsular Thailand. Almost the whole Central Valley of Thailand is in the rainshadow of the Western Mountains, and the Korat Plateau, or North-East Region, is also a relatively dry zone.

Relief and Drainage

As in Burma, there is in Thailand a semi-circle of uplands partly enclosing a central plain which is drained by a major river system.

To the west lie the Western Mountains with their *ridge-and-valley topography*. Running in a NNW-SSE direction in the north, these mountains continue southwards into Peninsular Thailand where they veer to the left, in a NNE-SSW alignment.

To the north is a region of parallel mountain ridges which are an extension of



the Shan Highlands in Burma. Between these parallel mountain ridges flow the Ping, Wang, Yom and Nan rivers, which form the tributaries of the Menam Chao Phraya. Heights of over 6,000 feet are reached in the west. Indeed, it is here that the highest mountain in Thailand, Doi Inthanon (8,452 feet), is found. Eastwards, the altitude of the ridges falls. Here most of the peaks do not rise above 3,500 feet. Farther east, altitude rises again and heights of over 5,000 feet are reached.

North-east Thailand is occupied by the Korat Plateau which is formed of a horizontal bed of red sandstone. While averaging 500 feet in height, the plateau is highest in the west and south, and slopes gently to the east, towards the valley of the Mekong. These two scarp faces tend to cut off this physical unit from the Central Valley, and this region has tended to look out towards the Mekong.

To the south-east of Thailand lies a dissected upland area which is an extension of the Cardamom mountains of Cambodia. Here, peaks range between 2,500 and 5,000 feet high.

Enclosed by these highland units is the Central Valley, drained by the Menam Chao Phraya and its tributaries. This is the heartland of Thailand and the most densely-settled region. The Central Valley measures approximately 300 miles from north to south and from east to west its width varies between 75 and 150 miles. It is a depression in which layers of alluvial material have been deposited, and no point in the Valley rises above 300 feet.

Thus the geographical layout of the relief features of Thailand is broadly similar to that of Burma.

In drainage too, Thailand, like Burma, is dominated by a single river system — the Chao Phraya and its tributaries. On account

of its shorter length the Chao Phraya is less important as a highway of communication than the Irrawaddy. Nevertheless, it has played an important role in serving to concentrate the people in the lowland.

In the west, the alignment of the mountains is such that the rivers drain north-westwards into Burma and south-eastwards into the Gulf of Thailand. Of the rivers which flow south-eastwards from this watershed, the Meklong is the most important.

In Peninsular Thailand, the rivers are small and unimportant. Here the rivers flow north-eastwards into the Gulf of Thailand and south-westwards into the Andaman Sea, following the trend of the mountain ridges.

Owing to the tilt of the Korat Plateau, the rivers of this region, mainly the Nam Mun and Nam Chi, drain towards the Mekong. It is this fact which causes widespread flooding of the Plateau during the wet monsoon period.

Thus with the exception of the Korat Plateau drainage system, most of the rivers of Thailand focus on the Central Valley. In a country where rivers are still important as highways of communication and transport, this natural convergence has helped in the unification of the country.

Climatic

The climate of Thailand is broadly similar to the tropical monsoon climate of Burma. The climatic year is divided into two main seasons, the wet South-West Monsoon season, from late May or June to October, and the dry North-East Monsoon season, from November to February. A transitional hot and dry period lasts from March to May.

TEMPERATURE

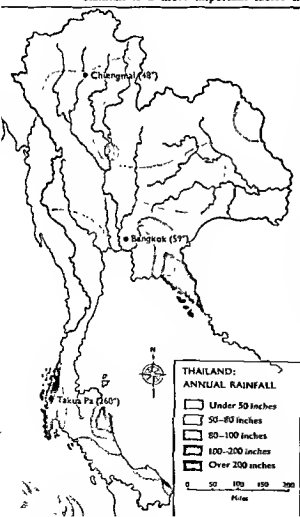
Peninsular Thailand, which is nearer the

SOUTH-EAST ASIA

equator than the other regions, experiences uniformly high temperatures of 80°–85°F throughout the year. In other regions the mean monthly temperatures are 70°–75°F in the cool season and 85°–90°F in the hot season. In parts of the Central Valley and Korat, maximum temperatures of over 100°F are often recorded in the hottest months of April and May.

RAINFALL

Rainfall is a more important factor in

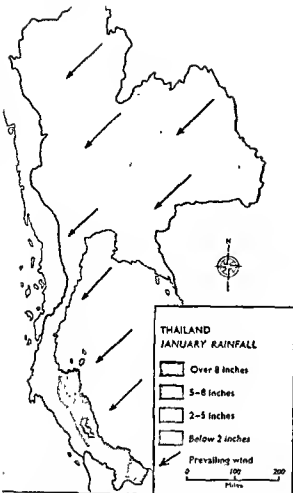


the climate of Thailand. Most of Thailand receives the greater part of its annual rainfall during the South-West Monsoon from late May to October. The exception is the East Coast of Peninsular Thailand, where parts of the region receive rain from the North-East Monsoon which has crossed the Gulf of Thailand.

The amount of rainfall depends mainly on relief. The wettest part of the country is the West Coast region of Peninsular Thailand, especially in the western part of the Isthmus of Kra and immediately south of it. The highest annual rainfall of 260 inches has been recorded at Takua Pa, about 70 miles north of Phuket. Most parts of the region receive the greater part of their annual rainfall during the South-West Monsoon season, but parts of the East Coast have their rain brought by the North-East Monsoon. As a result of this, the greater part of the region receives between 80 and 100 inches a year with some parts receiving 100–200 inches.

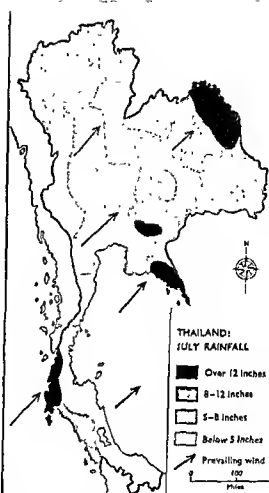
In South-East Thailand the eastern coastal mountains and ranges receive 100–200 inches a year, but the western half of the region gets only 50 to 80 inches annually.

The Central Valley and the interior of the Korat Plateau are much drier regions. They are both in the rainshadow of highlands, and when the South-West Monsoon descends to the plain after crossing the highlands, it exercises foehn-like warming and drying effects. There is rain when the summer air-stream moves northwards from the Gulf of Thailand. Large parts of the Upper Plain of the Central Valley, the southern and lower part of the Northern Region, and the interior and south-western part of the Korat Plateau, all have only 25–50 inches of annual rainfall. The Bangkok Plain is slightly wetter in climate with 50–80 inches a year (e.g.



Bangkok, 59"), partly because it is nearer the influence of the sea. But a western strip directly in the rainshadow of the Western Mountains receives much lower rainfall.

Of the total rainfall in the Central Valley only about 40 inches is received during the rice growing and maturing period. In such warm latitudes as the Central Valley, rice requires 70 inches of rain to mature properly during the growing season. Since the rainfall is far from sufficient, the cultivation of rice has to depend greatly on irrigation or direct



floods from the rivers.

In the Northern Region the high relief results in heavier rainfall, between 50 and 80 inches a year, but in the southern part of the region and especially in the inland valleys and intermontane basins, less rainfall is received, e.g. Chiangmai, 48".

Most of the interior of the Korat Plateau, with its low relief surrounded by a ring of highlands, receives only 25-50 inches of rainfall annually. The northern and eastern parts have 50-80 inches a year. But the amount of *effective* rainfall is considerably

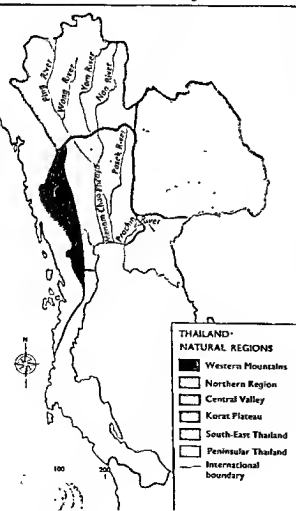
less owing to the porous nature of the soils and the high evaporation rates.

The North-East Monsoon season from November to February is a very dry period during which most parts of the country, except Peninsular Thailand, receive less than 1 inch of rain a month.

Natural Regions

Thailand may be divided into six natural regions:

1. The Western Mountains.
2. The Northern Region.



3. The Central Valley.
4. The Korat Plateau or North-East Region.
5. South-East Thailand.
6. Peninsular Thailand.

THE WESTERN MOUNTAINS

This region is a strip of rugged and sparsely populated mountainous country along the Burma border. It is dominated by a system of almost parallel mountain ranges and valleys with a north-south trend. The rivers and streams in the region have cut deep, narrow valleys in the mountains. The westernmost mountain range continues southwards into Peninsular Thailand. The central and eastern ranges lie between the valleys of rivers which flow into the Mekhlong river. There are no roads or railways across the Western Mountains.

THE NORTHERN REGION

This is a highland region lying roughly north of 17°N . It is dominated by an intensely folded mountain system consisting of parallel mountain ranges and river valleys with a north-south trend. The Northern Region has the highest relief in Thailand, and the highest mountain in the country (Doi Inthanon, 8,452 feet) is found in this region.

Between the mountain ranges are the upper valleys of the tributaries of the Chao Phraya river system. The main rivers flowing southwards are the Menam Ping, the Wang, the Yom and the Nan. These rivers and their tributaries pass through a number of relatively wide level tracts or intermontane basins. These lie at different elevations and are separated by gorges. For instance, the Nan river, from its headwaters southwards, flows first through a basin of 1,000 feet altitude, then a lower one at 750 feet, a

third basin at 700 feet, and finally a basin at 650 feet in the south.

The Ping flows through three important basins, the third and lowest one being the relatively large Chiengmai Basin at 1,000 feet. In the far north of the region there are other intermontane basins drained by rivers flowing into the Mekong river to the north.

The Northern Region is the teak region of Thailand. As there is a long dry season each year, the northern mountains carry a natural vegetation of mixed deciduous monsoon forests up to about 2,500-2,800 feet. Many small stands of teak trees are irregularly distributed in these deciduous forests. The teak logs are floated down the Ping, the Wang, the Yom and the Nan and other smaller tributaries of the Chao Phraya river system to the sawmills at Bangkok.

On the forested mountains of the Northern Region live primitive hill tribes who practise shifting cultivation. But most of the people in the region are Thais who live in the river valleys and intermontane basins, which have the advantages of level terrain, relatively fertile soils and facilities for irrigation. They cultivate wet rice and other crops with the aid of irrigation. Many of them are engaged in extracting teak from the neighbouring teak forests.

THE CENTRAL VALLEY

The Central Valley of Thailand is a great depression flanked by uplands on the west, north and east. The vast depression has been built up into an extensive alluvial plain with river alluvials deposited by the tributaries and distributaries of the Chao Phraya river system.

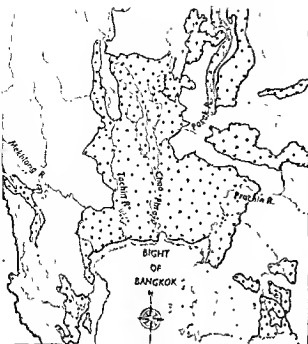
The Central Valley extends from approximately 17°N southwards to the Gulf of

Thailand. It stretches for about 300 miles from north to south and between 75 and 150 miles from east to west, with its greatest width in the south. It covers the greater part of the drainage area of the Chao Phraya river system, which totals over 60,000 square miles. The region lies mostly below 300 feet above sea level.

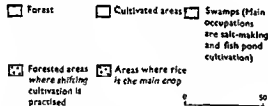
The Chao Phraya river system is not dominated by a single river, as is the case with the Irrawaddy in Burma or the Indus in West Pakistan. The Menam Chao Phraya is only one of the several large rivers in the whole river system. There is, in fact, no Menam river in Thailand as stated in some books, for the word 'menam' simply means 'river' in the Thai language. The names of many large rivers have the prefix 'menam', e.g. Menam Ping, Menam Mun (in Korat), and of course Menam Chao Phraya.

The Chao Phraya river system consists mainly of four large tributaries in the north and two main distributaries and one large tributary in the south. The four northern tributaries, the Menam Ping, the Menam Wang, the Menam Nan and the Menam Yom, meet near Nakhon Sawan to form the Menam Chao Phraya. After flowing for a short distance, the Chao Phraya branches into two main distributaries. The western distributary, the Nakhon Chaisi (or Tachin) is the weaker of the two distributaries. The eastern distributary, the Menam Chao Phraya proper, sub-divides into three channels, which re-unite farther south and flow as one large river through Bangkok on the way to the sea. Near Ayurhaya (pronounced, *Ah-yu-tha-yah*) the Pasak river joins the Chao Phraya.

Although the Chao Phraya proper is only one of the rivers draining the Central Valley, the Thais regard it as the chief river of



LOWER THAILAND LAND USE



their country. The whole system of rivers related to it and draining most of the Central Valley may be called the Chao Phraya river system.

Two other rivers have helped to form the deltaic plain in the lower southern part of the Central Valley. To the west is the Meklong, fed by water from rivers flowing from the Western Mountains. To the east is the Prachin, which flows from the mountains along the south-east coast and the Cambodian border. Both the Meklong and the Prachin flow directly into the Bight

of Bangkok without joining the Chao Phraya river system.

The Central Valley is the most important region of Thailand mainly because it has the largest extent of alluvial lowlands with the best soils in the country, and is served by the best system of inland waterways, the Chao Phraya river system. These advantages resulted in concentrations of population and agriculture, which in turn brought about other developments such as the expansion of the transport system to include railways and roads.

The Central Valley may be divided into two sub-regions: the Upper Plain and the Bangkok Plain (the lower plain).

The Upper Plain consists of the combined middle and lower valleys of the Ping, the Yom and the Nan, and also the long and relatively narrow upper valley of the Pasak in the eastern part of the Upper Plain. The Plain has an undulating hill-and-valley relief. The river valleys of the Ping, Yom, Nan and Pasak are separated from one another by low hills and higher uplands. Within the alluvial plain along each river, low outcrops of rock and foothills protrude here and there. The best alluvial lands where most rice is cultivated are the lower valleys of the Ping, Yom and Nan, which occupy the southern part of the Upper Plain.

The Bangkok Plain consists of more extensive lowlands than the Upper Plain. It begins just north of Nakhon Sawan where the northern rivers meet to form the Chao Phraya. The Chao Phraya, the Nakhon Chaisi, the lower Pasak, the Meklong and the Prachin have built up a vast deltaic plain with a surface of alluvial material over 400 feet thick. Heavy deposits of alluvium are being added each year as a result of the annual flooding of the plain. The plain is generally very low-lying and flat. At

Bangkok it is only a few feet above sea level. At Ayuthaya, 60 miles from the sea, the height of the plain is only 13 feet above sea level, and at Nakhon Sawan, about 150 miles from the sea, it is only 77 feet above sea level. The low relief is broken only by levees and alluvial banks.

It is this gentle gradient of the plain that makes it possible for almost the whole plain to be flooded during the season of high water in the rivers, usually from June to December. The annual floods re-fertilise the soils in the plain. The floodwater is often very deep, between 12 and 16 feet in many areas. This is too deep for the growing of ordinary rice and in such areas, the Thai farmers cultivate 'floating padi' which has very long stalks.

The length of the flood season and the depth of the floodwater are very irregular. In some years the river flooding occurs late, or the floodwater fails to reach certain outlying areas. There is, however, a network of canals to distribute the river water to areas not normally reached by the floods, and areas which the floodwater often fails to cover. The canals are mostly of the older inundation type. But some modern irrigation works have been constructed to ensure controlled supplies of river water. These are as yet not adequate, and the rice farmers of the Bangkok Plain often face serious crop losses owing to the uncertainty of water supply and at times owing to the floodwater being too deep or remaining too long. Farmers do not depend directly on the rainfall, which is not heavy enough for rice-growing.

THE KORAT PLATEAU

The Korat Plateau or the North-East Region is a huge region with a gently undulating terrain. It is a large saucer-like

low platform of more than 60,000 square miles. It is separated from the rest of the country by high and steep scarps which form its western and southern rims.

The greater part of the Korat Plateau is only between 300 and 650 feet in elevation. Such elevations are usually considered low. On the north and east the region is bordered by the great Mekong river. On the west and south it is bordered by highlands with steep scarps. The western scarps present a steep front to the Central Valley, and the high southern scarps face South-East Thailand and Cambodia.

The western rim seldom exceeds 1,500 feet in elevation, but a group of highlands reaches 3,000 feet. The southern rim is higher and reaches a maximum of more than 3,300 feet. But where the western and southern rims meet in the south-west of the Korat Plateau, great heights of more than 4,000 feet are reached. The western rim used to isolate the Korat Plateau from the rest of Thailand. There is no direct river connection between the region and the Central Valley, but now there are important road and rail connections between the two regions.

The Plateau surface is tilted towards the south-east. Ubon, near the south-east corner, is only about 200 feet above sea level. The main rivers flow towards the south-east into the Mekong. The greater part of the region is drained by the river system of the Menam Mun (la Moon). Most tributaries of the Mun join it from the northern side. Of these tributaries, the Chi is the most important. On the northern and eastern edges of the region some smaller rivers drain directly into the Mekong. But most Korat rivers flow into the Mun, which empties into the Mekong.

The rivers of the region flow through

wide, shallow valleys. During the rainy season their channels fill up rapidly and the water floods the shallow valleys. As the gradient of the rivers is very gentle, the run-off is very slow and both the natural and artificial drainage become very difficult, especially when the water of the Mekong itself rises very high. The water of the Mekong rushes far up the valley of the Mun, adding to the flooding already caused by the rains swelling the lower parts of the Mun river system. The two sources of flooding cause the floodwater to be very deep and to remain very long in the lower parts of the region. Such areas cannot be used even for growing deep-water padi, and only the higher but less fertile margins of the seasonal swamps are suitable for padi cultivation. The annual flooding is, however, restricted to a narrow zone only 2-5 miles wide along the lower courses of the main rivers.

Although the main rainy season occurs during the South-West Monsoon, the part of the Korat Plateau lying in the rainshadow of the western and southern mountain rims does not receive much rain during this season. The south-western and interior parts of the region, covering about half the drainage area of the Mun river system, have only between 25 and 50 inches of rain annually. During the North-East Monsoon, the region as a whole suffers from intense drought. The rivers during the dry season are too shallow for irrigation and even for boat traffic.

The lack of water in certain parts during the South-West Monsoon and in most parts during the North-East Monsoon is accentuated by the low relative humidity of the air, the lack of a cloud cover, the very high temperatures during the hot season and the strong winds during the cool season. All these factors cause a great deal of evaporation. The greater part of the region

is covered with lateritic soils formed from red sandstone. These are generally thin, porous and infertile.

The region suffers from a lack of alluvial soils, except in the valleys of the Mun and the Chi. Even in these more fertile areas there is only a thin alluvial cover over the base rocks, unlike the thick alluvium in the Central Valley. In many areas crusts of salt have been formed on the land surface. This adds to the soil problems of the farmers.

SOUTH-EAST THAILAND

This relatively small region in the south-east, facing the Gulf of Thailand, consists of a dissected upland area and a narrow coastal plain. The uplands are an extension of the Cardamom Mountains of Cambodia which jut westwards into Thai territory. Between the upland area and the Korat Plateau to the north lies a broad, low corridor drained by the Prachin. This corridor provides a passage between the Toole Sap plain of Cambodia and the Bangkok Plain. It is traversed by a road and a railway which link Phnom Penh with Bangkok. But as the alluvial plain of the Prachin Valley merges with the Bangkok Plain, it is regarded as a marginal extension of the Central Valley.

The rugged uplands of the South-East Region include a number of peaks between 2,500 and 5,000 feet. The region is drained mostly by streams flowing in a southerly direction. These have built up small alluvial patches along the coast. The coast is of the sunken type with an irregular coastline fringed with numerous off-shore islands which are the peaks of drowned mountains.

The region, especially the eastern two-thirds of it, receives heavier rainfall than either the Central Valley or the Korat Plateau. The eastern part has very heavy rainfall

during the South-West Monsoon. The inhabitants are mostly rice farmers and fishermen. Those in the drier western part grow much sugar-cane as well as padi. The population is concentrated along the narrow coastal plains and in the river valleys opening southwards to the Gulf of Thailand.

PENINSULAR THAILAND

Peninsular Thailand extends for about 600 miles from north to south. Its width varies from 10 to 135 miles. North of the Kra Isthmus it shares the peninsula with Burma, but south of the Isthmus it occupies the whole peninsular width.

The interior highlands of the region, which form the mountainous backbone of the peninsula, extend from north to south in a series of relatively short ranges. One of the mountain ranges is Phuket Range, which stretches from the Isthmus of Kra to Phuket Island, situated off the west coast. There are many granite cores in this range, the source of rich alluvial tin-ore. Farther south there are several parallel ranges, one of which crosses the Malaysian border into Kedah. Another extends into Malaysian territory as the Main Range of West Malaysia. The short rivers of Peninsular Thailand have deposited tin-bearing alluvials on the sides of nearly every granite range or outcrop.

With the system of parallel mountain ranges occupying the interior of Peninsular Thailand, the region may be sub-divided into a West Coast region and an East Coast region. The West Coast shoreline is irregular, marked by many estuaries and bays and fringed with islands, e.g. those in Phuket Bay. The coastal plain is narrow, as the mountains reach the sea in many places. Many areas are poorly drained and swampy.

The East Coast has a more regular coastline and a much wider coastal plain. It consists of several river plains and alluvial basins extending far inland.

There is a smaller temperature range and a much heavier rainfall in this region than in the other regions of Thailand. The rainfall is more evenly distributed throughout the year. The mountainous interior is densely forested, and most of the settlements are located along the coast and in the river valleys.

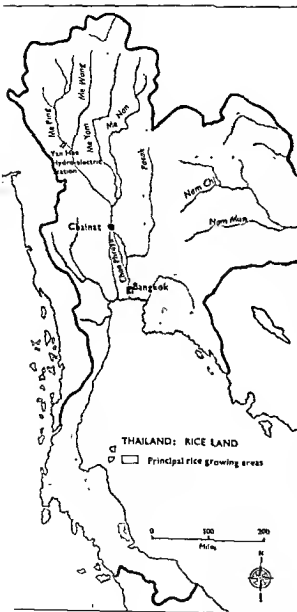
Agriculture

Agriculture is the mainstay of the economy of Thailand. More than 80% of the people of the country are dependent upon agriculture for their livelihood. Agriculture is the main source of the country's wealth, and agricultural products account for about 75% of the export earnings.

In Thai agriculture, padi is the dominant crop both in terms of acreage and value. Padi is the country's biggest revenue earner. It is the dominant crop not only in the

Transplanting of padi-seedlings. The farmers knock the earth off the padi-seedlings before they transplant them.





Central Valley, but also in other regions such as Korat and the Northern Region.

Although padi cultivation is precarious because of variabilities in rainfall amount and distribution, the acreage under padi has expanded enormously during recent years. Before World War II the total acreage under padi was nearly 8 million acres. The present acreage is 17.2 million acres, more than double the pre-war acreage.

The total rice production is about 11.8 million tons a year. Most of this, however, is consumed within the country, but in spite of the rapidly growing population, there is usually a large surplus for export. The annual exports of rice have steadily increased in the last few years from 1.1 million tons to 1.8 million tons. Thailand now ranks with Burma as the two leading rice-exporting countries. Its rice exports meet a very great demand from other countries in Monsoon Asia.

The great expansion of rice cultivation and production has been due partly to the Government's encouragement and its construction of modern irrigation works, and partly to the fact that only padi can be profitably grown on most agricultural land, as the soils in Thailand are generally of low fertility and food crops other than padi give poorer yields when planted in such soils.

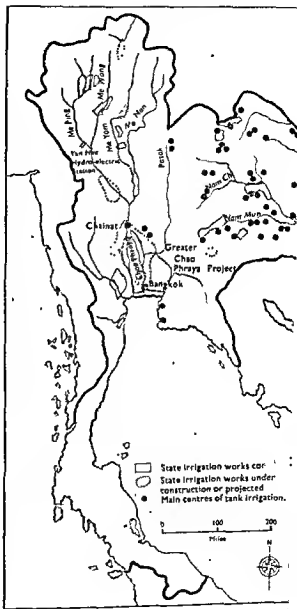
Distribution of padi-growing areas

In all the padi-growing regions of Thailand, except the West Coast of Peninsular Thailand and the Western Mountains, padi is grown as a cash crop as well as a subsistence crop. **THE BANGKOK PLAIN** The chief padi-growing region is the Central Valley, especially the Bangkok Plain where padi is grown primarily as a commercial crop and secondarily as a

subsistence crop. In the Bangkok Plain, padi is almost the only major crop. Other crops are grown only on a very small scale. The Bangkok Plain accounts for almost half the total production in the whole country. The padi is of a higher quality than that grown elsewhere, and this fact, as well as the nearness of the port of Bangkok, has led to most rice being exported from the region.

Climatically, the Bangkok Plain is not ideal for padi cultivation. The rainfall required during the growing and maturing period from June to November should be 70 inches for such warm latitudes, but only about 40 inches of rainfall is received. However, the annual flooding of the Chao Phraya river system makes up for the shortage of rain-water in most parts of the plain. But the rainfall is often far below the average, with the result that the flood level in the rivers is too low and the annual flooding is not adequate. In such years, the large networks of inundation and distribution canals are not fully effective. On the other hand, excessive flooding in other years damages rice crops. This is because there are few dykes or embankments to control the river floods as in Burma or North Vietnam. Moreover, drainage facilities are poor and even in normal years, much of the deltaic land remains too long under water, till January or later.

Owing to the irregular rainfall and uncertain water supply, the amount of rice harvested varies considerably from year to year, and the amount exported annually varies with it. The Government has, however, constructed several modern irrigation works to control the height of the river-water and to supply just enough irrigation water. The main scheme is the Greater Chao Phraya Project which includes a large dam across the Chao Phraya at Chainat, and



fourteen other smaller dams downstream which regulate the water supply and control the river floods. This has brought 3.7 million acres under proper irrigation and has made it possible to double the rice production of the delta region. The scheme enables a second crop of rice to be grown during the dry season and reduces the great risks often faced by rice farmers.

In areas of the Bangkok Plain where the floodwater is very deep, 'floating padi' with long stalks is planted. The broadcast sowing of the grain is the method used in planting such padi, especially where the local rains and the river floods occur at about the same time. But where the floods are reliable and come some time after the local rains have started, the nursery and transplanting system is used. However, even in such areas the broadcast sowing of padi is sometimes adopted to save labour and time, as there is a general shortage of labour and farmers with moderately large family holdings cannot afford to engage hired labourers.

THE KORAT PLATEAU This is the second most important padi-growing region in Thailand. In spite of the generally infertile soils and uncertain rainfall, this region has about 37% of the country's total padi acreage and produces about 30% of the total rice production, especially of glutinous rice. The most important padi-growing areas are in the valleys of the Mun and the Chi. Subsidiary areas are in the valleys of the northern rivers flowing into the Mekong. The Korat padi-growing districts are widely scattered and not concentrated in a few large areas as for the Central Valley. This is because of the lack of irrigation facilities in many areas. Less than 10% of the acreage under padi is irrigated, owing to the shortage of river-

water during the dry season.

The Government has constructed a number of irrigation tanks of the Indian type in various parts of the region. There are also modern irrigation works constructed on the upper Mun Valley and a tributary of the Mun. In northern Korat, too, modern irrigation works have been constructed on two rivers near the Mekong. These works prevent severe flooding as well as supply enough water during the growing season. But there are few suitable dam sites as the rivers have irregular flow of water and the population is very scattered. Therefore, irrigation tanks offer a better solution to the water problem than large-scale modern works.

The padi-fields in the Mun Valley, which are the largest in acreage, are served by the railway to Bangkok. It is mainly from them that large amounts of rice are exported from the region. Some 300,000 tons of glutinous rice are sent annually to the Central Valley to enable farmers there to release better rice for export. There are also considerable quantities of non-glutinous rice exported from the Korat Plateau.

THE NORTHERN REGION This is the third most important padi-growing region, in spite of the mountainous terrain and the limited area of flat land available. The padi-growing districts are scattered among the intermontane basins and the wider parts of the river valleys. The Ping river valley, especially around Chiangmai and Lamphun (*Muang Lamphun*), is the most important area. Other important districts are around Lampang, Nan and Phrae.

The rivers near which these areas are situated are much smaller than those in the Central Valley farther south. It is easier to construct simple dams across them and lead the water to the fields. In the

intermontane basins small creeks from the mountains are easily diverted to irrigate the padi-fields. With regular quantities of water available and the use of simple but effective irrigation methods, the farmers of the Northern Region obtain more regular and certain yields than farmers elsewhere in the country. The yields per acre are, in fact, the highest in Thailand, but the total rice production forms only some 8% of the country's total.

PENINSULAR THAILAND AND SOUTH-EAST THAILAND In these regions there are many small fields along the coasts and in the narrow mountain valleys. In the East Coast of Peninsular Thailand the padi lands are more extensive, whereas in the West Coast the padi-growing areas are much smaller and padi is grown almost wholly for subsistence.

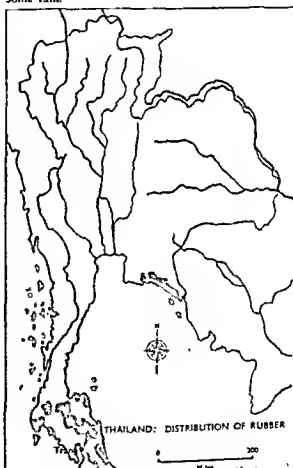
Rubber

The second most important crop in Thailand is rubber. As a commercial crop it ranks second to rice in export value. The rubber acreage has expanded during the last ten years from about 650,000 acres to more than 1.3 million acres. The production of rubber has increased with the acreage, and the annual total production is about 235,000 tons, most of which is exported. Thailand ranks third among the world's chief rubber-producing countries, after Malaysia and Indonesia.

The chief rubber-producing areas are in Peninsular Thailand and South-East Thailand. In these regions there is adequate rain in many parts. In Peninsular Thailand rubber is grown south of the Isthmus of Kra, where the annual rainfall is heavier and more evenly distributed than in areas north of the Isthmus. The rubber-growing areas are along both the West Coast and the

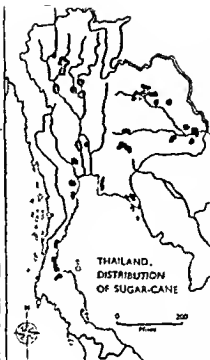
East Coast. Trang, on the West Coast, is the most important centre of the rubber industry. The plantations are owned by Thais, Malays and Chinese, but the Chinese control the larger plantations.

In South-East Thailand rubber occupies the lower slopes of the highlands in the eastern half of the region, where the annual rainfall is heavy and the rainy South-West Monsoon season begins early and ends late. During the dry season, which is relatively short, local land and sea breezes often bring some rain.





THAILAND.
DISTRIBUTION
OF MAIZE



THAILAND.
DISTRIBUTION
OF SUGAR-CANE



THAILAND:
DISTRIBUTION OF
FIBRES (JUTE
AND KENAF)

Other Food Crops

Much of the soils of Thailand is unsuitable for grains other than padi. The Government has, however, encouraged farmers to grow other food crops so that the country need not depend too much on padi as the one-and-only export crop. The cultivation of maize and tapioca has proved very successful. Their acreage and production have greatly increased. Maize, which was introduced only in recent years, has become a major cash crop and an important export commodity, as little maize is consumed by the Thai people, who prefer rice. Two crops of maize can be harvested each year in most parts of the country, as the crop is well adapted to the soil and climatic conditions of Thailand.

Maize is grown in all parts of the country except the West Coast of Peninsular Thailand. In the Central Valley, it is grown mostly in the Upper Plain and in Saraburi

province in the Bangkok Plain. In the Korat Plateau, it is grown between upland rice crops especially in areas where shifting agriculture is practised. The most important area in the Korat Plateau is around Nakhon Ratchasima (Korat town).

Nearly 1.3 million tons of maize is produced each year. Most of it is exported to Japan. Singapore is the second most important buyer.

Tapioca has also increased in importance as an export crop. Over 2 million tons of tapioca is produced annually. The main tapioca products are shredded or sliced tapioca, tapioca flour and tapioca meal. The main tapioca-growing areas are in the western part of South-East Thailand and in Peninsular Thailand. In Peninsular Thailand, tapioca is planted mostly along the railway in the East Coast region, where the cultivation and processing are largely in the hands of the Chinese. Modern

factories have been set up to produce high-quality tapioca flour for the world market. West Germany and the Netherlands are the main buyers of shredded tapioca and tapioca flour.

Sugar-cane

This is another fast expanding crop, whose acreage has increased to more than sixteen times that of the pre-war years. Nearly 5 million tons of cane are produced annually, and the country is nearing self-sufficiency in the production of sugar. The most important sugar-cane growing area is Chonburi province in the west of South-East Thailand. Other important areas are in the northern part of the Korat Plateau, Uttaradit and Lampang provinces in the Northern Region and Nakhon Sithammarat province in the East Coast of Peninsular Thailand.

Jute and Kenaf

The rice industry of Thailand needs many million rice-bags each year. To manufacture these bags, large quantities of jute and kenaf are produced within the country. Jute is grown in only a few areas, near rivers with light, alluvial soils, especially in Ayuthaya province in the Bangkok Plain. Kenaf, a jute substitute, can be grown in many types of soils and under different climatic conditions. It thrives even in the forest clearings and uplands in the Korat Plateau. From local jute and kenaf, the factories in Thailand manufacture about 43 million gunny-bags a year, and yet there is a large surplus of kenaf and jute for export, totalling over 320,000 tons a year. Jute and kenaf now rank fifth among the chief exports, after rice, rubber, tin and maize.

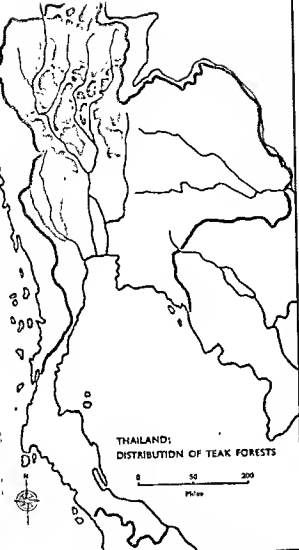
Other minor crops include coconuts, grown in almost every part of Thailand but chiefly

in the East Coast of Peninsular Thailand and the coastal areas in South-East Thailand. Crops of groundnuts, green beans and soya beans occupy a fairly large acreage. Tobacco is planted mainly in the Northern Region, especially in Chiangmai province, and also on the marginal plains of the Korat Plateau. Kapok and cotton are important fibre crops. Cotton is grown in many parts of the Korat Plateau, especially in the north-west province of Loei. The Korat Plateau produces some 60% of the national output of cotton. Kapok is grown mainly in Ayuthaya province and in the Western Mountains. Kapok yields a fibre used in stuffing mattresses and cushions, and kapok seed yields an oil used in the making of soap. Both kapok fibre and seed feature among the exports of Thailand.

Livestock

Rice farmers all over Thailand depend on either large water buffaloes or smaller oxen for heavy agricultural work. There are about 6.8 million buffaloes and 5.2 million bullocks in the country. About half the 12 million cattle are in the Korat Plateau alone. On the Korat Plateau there are vast areas of forested low hills and undulating land not used for rice cultivation. The open forests have abundant grass. There is also plenty of fodder from the secondary crops such as tapioca and maize. Most farmers rear some cattle to earn extra income. The surplus cattle are sold to farmers in the Central Valley where pasture land is scarce. About 70,000 cattle are exported annually from Thailand, and most of them are from the Korat Plateau.

Pigs are also reared by many farmers for sale to the Chinese in Bangkok and other large towns and also for export. There are 11,000-12,000 elephants, mostly found in



the Northern Region where they are used by loggers in the timber industry.

Fishing

About 60% of the farmers in Thailand catch fish for their own consumption, as fish form an important item in the daily diet of the Thais. Fishing is carried on along the whole length of the 1,625-mile

coastline, especially in the Gulf of Thailand, and also in the rivers, canals, padi-fields, swamps and fish-ponds. Salted fish and shrimp are among the 220,000 tons of fish products exported annually.

Lumbering

About half of the total area of Thailand is covered with primary forests and timber forests. Teak is the most important of the forest products. Other timbers such as yang wood and another tree product, sticklac, are also of some importance. Yang timber is produced in greater quantities than teak, but its commercial value is much less.

The deciduous forests, in which stands of teak trees occur, lie mostly north of 17°N. About half the commercial teak is extracted in the Yom Valley and the rest is obtained in the Wang Valley and the Ping Valley. The Yom Valley is the richest teak area in the country. All these areas are in the Northern Region, especially on the drier sites in the region and on lateritic soils up to 2,500–2,800 feet. The teak logs are floated down the Chao Phraya river to Bangkok and other towns along the river route.

Teak used to rank fourth among the exports of Thailand, after rice, rubber and tin. But its production and exports have declined, owing to excessive cutting and insufficient replanting, and now teak ranks only seventh among the leading exports. It comes after rice, rubber, tin, maize, jute and kenaf, and tapioca products.

Minerals

Thailand is relatively poor in mineral resources, having only limited reserves of a small number of minerals. Besides tin and tungsten, there is a small production of iron-ore, lead, antimony, lignite and salt

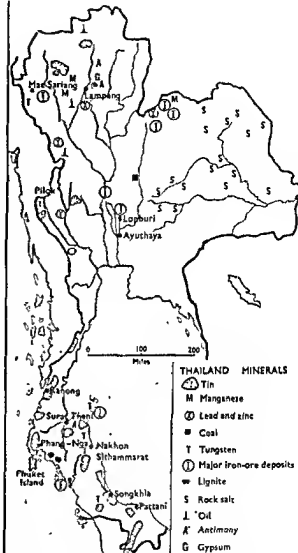
Tin

The tin deposits of Thailand are part of the great tin belt stretching northwards from Bangka and Belitung through West Malaysia into Thailand and Burma. They are mostly alluvial deposits, the richest of which occur in the most westerly of the granitic ranges in Peninsular Thailand. Over 80% of the output is obtained from the area stretching southwards from Ranong to Phuket Island. Phang-Nga is the main tin-producing area. On Phuket Island itself, the lower alluvial slopes on all sides of the central mountain region have rich deposits. Tin-ore is also obtained from the sea-floor off Phuket and farther north, where it is mined by large dredges. Other important mining areas are in the East Coast. These eastern areas include a granitic range between Surat Thani and Nakhon Sithammarat, the region from Songkhla southwards, and the Pattani Range.

The largest number of mines are found in the western areas of Takua Pa, Phang-Nga, Ranong and Phuket. Although Thailand is a minor world producer of tin, the mining of tin is an important source of income for the country and exports of tin ingots rank third among the chief exports, after rice and rubber.

Tungsten

Tungsten ore is obtained in two main regions: (i) the Western Mountains, and (ii) Peninsular Thailand. Tungsten ore is often found together with tin, mostly in the form of wolframite. In the Western Mountains the production of tungsten is more important than that of tin, while in Peninsular Thailand tungsten is secondary to tin. The most important tungsten-producing area is Pilok in the Western Mountains, the largest single source of tungsten in the country. The Pilok area



lies to the west of the Khwae Noi, a tributary of the Mekhlung.

Iron

There are small reserves of iron-ore in many parts of the country and some two dozen deposits are known. Some reserves north of Lopburi are being worked, and

there is a blast furnace near Saraburi, north-east of Ayuthaya, for smelting the iron-ore and producing pig-iron and structural steel.

Salt

Salt is evaporated from sea water at salt ponds along the gulf coast between the Nakhon Chaisi and the Mekhleng. Thousands of tons are produced annually in these salt works and sent by rail to Bangkok. Salt is also obtained from the rock salt deposits in the Korat Plateau.

Lignite

Lignite, a brown woody type of inferior coal, is mined mostly at Mae Moh in the Lampang area, some 60 miles to the south-east of Chiangmai. A thermal power-station at Mae Moh uses this lignite to produce power for the northern towns. Near Mae Moh, *gypsum* is also produced and used by the local cement industry.

Other minerals

Antimony is obtained from the moderately large reserves at Lampang and Phrae in the Northern Region, and at Surat Thani in Peninsular Thailand. Some manganese is mined in Loei province in the north-west of the Korat Plateau. Lead and zinc are obtained mainly from a major mine not far from the Pilok tungsten mines.

The mineral wealth of Thailand is still largely untapped. Petroleum resources in the Gulf of Thailand are yet to be exploited. At present only small-scale operations in petroleum production take place in the extreme north of Thailand.

Power

Since Thailand is short of good coal, the Government has constructed the large Yan

Hee Multi-Purpose Project on the Ping river to produce hydro-electric power for industries in Bangkok and other industrial areas. The huge Bhumibol Dam across the Ping river, to the north of Tak, is situated where the Ping flows out through a gap in the northern mountains into the Upper Plain of the Central Valley. The project also serves the purposes of irrigation, flood control and navigation.

Industries

Until recently there has been little industrial development in Thailand apart from the rice-milling, sawmilling and mining industries. This was partly because the Government did not welcome investment of foreign capital in industries. But in recent years the Government has encouraged private investors, both foreign and Thai, and by offering special terms has attracted them to a number of new industries. The special terms include income tax exemption for a period of five years and exemption from import duties and other taxes on machinery, equipment, machine parts and the chief raw materials needed for new industries.

Some 350 new industrial projects have been started. These are fairly large projects, each employing more than 150 workers, and have given employment to nearly 60,000 people. To promote further industrial development, the Government is building a broad industrial base by improving the power supply, the system of transportation and also irrigation and drainage facilities. The improvement of agriculture is also important for increasing agricultural production to feed the industries with raw materials.

According to the Thai Ministry of Industry, there are altogether some 38,500 industrial

units in Thailand, 95% of which are small units employing less than 50 workers. Of the total number, about 22,800 units are rice-mills, including several thousand small mills which turn out 8 to 12 tons of rice daily. The large rice-mills are located in or near Bangkok, while the small ones are located in all important padi-growing districts. The large number of rice-mills indicates that rice-milling is the most important industry. It employs the greatest number of workers. In addition, there are some 1,000 flour-mills producing flour.

There are over 700 sawmills, of which the largest are in the Bangkok area. The sawmills process not only teak, but also other types of timber such as yang wood and teng wood. The sawmills outside the Bangkok area are situated along river courses, in or near cities and at railway junctions. The large sawmills in Bangkok are owned by Europeans and Chinese.

There are 2,000 metal workshops and machinery repair workshops, and some 400 small weaving mills with hand-operated looms. Apart from these, industrial establishments are fairly large and include many modern factories. The Government owns a number of large factories and industries: major cotton mills, cigarette factories, sugar refineries, and factories producing chemicals, canned foodstuffs, fertilizers and other products. Other large factories are privately owned.

There are many factories producing rubber goods, including tyres and tubes, assembling cars and other vehicles, radio and television sets, and manufacturing electrical equipment and cement. Within the last ten years the annual production of cement has increased from 400,000 tons to 1.3 million tons, cotton textiles from 75 million yards to 237 million yards, gunny-bags from 4 million to 43

million bags, and sugar from 80,000 tons to 320,000 tons.

The largest privately-owned industrial establishment is the Siam Cement Company which produces almost enough cement to meet the needs of the country. It also operates the iron and steel works near Saraburi.

The establishment of a tin-smelting works at Phuket in the main tin-producing area is an important development. Thai tin is no more exported mainly in the form of tin ore, but is smelted at Phuket and the exports are mostly in the form of tin metal (tin ingots).

The textile industry is important mainly as a cottage industry and partly as a modern factory industry. The spinning and weaving of cotton, silk and jute textiles occupy the first place in the cottage industry, especially in the Korat Plateau and the Northern Region, where raw cotton and mulberry are grown. The weaving of Thai silk, which caters for the growing tourist trade, is an expanding industry. The factory production of cotton textiles is based partly on raw cotton grown in the country, but increasing quantities of cotton yarn are imported to meet the rising needs of the industry.

Trade Exports

With its development programme and the diversification of agriculture, Thailand has been able to break away from being too dependent on the traditional exports of rice, rubber, tin and teak. New major export items such as maize, kenaf and tapioca products have joined the ranks of chief export earners. Kapok, beans, castor seed, millet, shrimps, tobacco leaves and cattle are also growing in importance. Export earnings have almost doubled in the last

ten years.

Rice and rice products remain the leading exports of the country. The amount exported varies from year to year, between 1.5 and nearly 1.9 million tons. The chief buyers of Thai rice are Hong Kong, India, Indonesia, Malaysia, Singapore, Ceylon and Japan—all in Moosoon Asia.

Exports of rubber have increased considerably to more than 200,000 tons a year. The most important customers are Japan, the United Kingdom and Malaysia. Japan takes about double the amount exported to the United Kingdom or Malaysia.

Tin, which is now exported mostly in the form of ingots, is exported mostly to the United States and the Netherlands. Maize now rivals tin as the third or fourth export commodity. It is exported mostly to Japan, with Singapore as the second but much less important customer. Jute and kenaf, fifth on the list of chief exports, are bought by India to feed the jute factories in the Calcutta area. Tapioca products are exported to West European countries for making industrial starch and glue.

Teak exports have become relatively less important. The amount exported varies with world demand. The main countries buying Thai teak are Italy, Denmark, West Germany and the United Kingdom, all in Western Europe.

Imports

The main imports are manufactured goods, machinery and transport equipment, chemicals, crude petroleum and petroleum products and foodstuffs.

Among the manufactured goods, cotton textiles and cotton yarn feature prominently. They are imported mainly from India and Japan. The great increase in the imports of machinery and transport equipment,

chemicals and mineral fuels reflects the increasing modernisation of the country, the growing needs of modern industries and the improvement of transport facilities. Japan is the chief supplier of the imports. Other important suppliers are the United States, the United Kingdom and West Germany.

Population

The total population of Thailand is more than 34 million and is growing rapidly at the rate of 3.2%. The average population density of 170 per square mile is fairly high. The population of Thailand is mainly rural as more than 80% of the people depend on agriculture for their livelihood. The distribution of the rural population is therefore determined by conditions that are favourable or adverse to agriculture. Among such conditions, those that relate to the cultivation of padi are the most important. This is because the Thai people are rice eaters, and also because padi is more productive than any other major food crop. Acre for acre, padi can support more people than any other major food crop.

The distribution of the population corresponds closely to the distribution of the best padi lands in Thailand. The important padi-growing areas are mostly located along the rivers and larger streams, especially their middle and lower valleys. Their upper valleys are narrow and lie in high or rugged terrain.

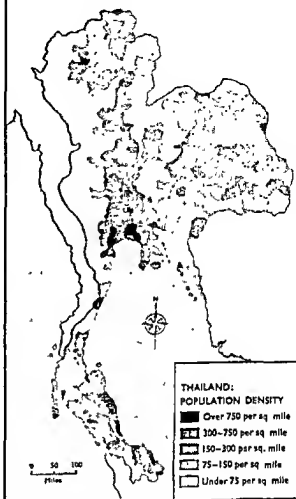
The concentration of padi cultivation and of high population densities is mainly due to the availability of flat and fertile land and supplies of irrigation water. On the other hand, the rugged Western Mountains, the thickly forested mountains in Peninsular Thailand and in South-East Thailand, and other highland areas are unfavourable for

agriculture and therefore discourage human settlement.

The mostly densely populated region is the Central Valley, especially the Bangkok Plain. The climatic conditions are not ideal for padi cultivation, but a combination of other factors make it suitable for the extensive growing of padi both as a commercial and a subsistence crop. These factors are the high proportion of level and low-lying alluvial land, the relatively fertile soils, the annual flooding by the Chao Phraya river system which provides water for wet padi cultivation and renews the soil fertility, and a close network of irrigation and navigation canals and natural waterways.

In the few provinces closest to Bangkok, the population densities are very high, between 1,000 and 4,000 per square mile. But in the greater part of the Central Valley, the densities are over 500. The marginal areas of the Bangkok Plain and the Upper Plain do not have the optimum conditions of the delta region and have population densities of 400-500 per square mile.

The Korat Plateau is the next most densely populated region, in spite of the generally infertile soils and lack of irrigation water in many areas. Many parts of the region, especially along the Muea and the Chi rivers and their main tributaries, and also along some northern rivers flowing into the Mekong, have densities of between 200 and 400. The drier conditions favour a rich and varied agriculture. This includes the widespread cultivation of padi, maize, tapioca, kenaf, jute, tobacco, sesamum, castor seed, sugar-cane, cotton and ramie. But the average population density of the region as a whole is only about 180. There are, however, signs of overcrowding in parts of the region in relation to their capacity to support a large population.



In Peninsular Thailand, the average population density is about 150. There are fertile coastal plains and river valleys well suited to padi cultivation. Besides, the large-scale cultivation of rubber and coconuts and the growing of tapioca, coffee and oil-palm, the development of coastal fisheries, and the mining of tin and tungsten, all make it possible for the coastal and foothill areas in both the East Coast and the West Coast regions to support a moderately large population.

SOUTH-EAST ASIA

The South-East region, an important sugar-cane growing area where padi, tapioca, groundnuts and castor seed are also abundantly cropped, supports an average population density of 140. The western, drier, coastal plain of the region is the most densely populated part, with densities of more than 250 per square mile.

The Northern Region has a slightly lower density of 120. This is relatively high for such a mountainous country with very limited alluvial land. But the greater ease in obtaining irrigation water and the more intensive methods of farming as compared with the Korat Plateau and even the Central Valley enable the intermontane basins and the wider stretches of river valleys to support fair densities of population.

The most sparsely populated region in Thailand is the Western Mountains and the adjoining western part of the Northern Region. Here the average population density is only about 50. Lower densities of 15-20 are found in the westernmost province of the Northern Region. This province is

the northern extension of the Western Mountains.

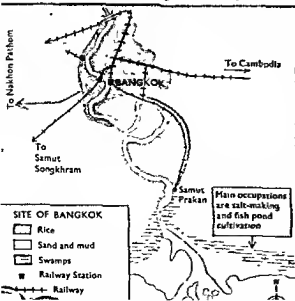
Towns

The Thais are mostly rural and not urban dwellers. None of the towns except two have more than 50,000 people. The two exceptions are Bangkok and Chiangmai. Bangkok is the only large modern city in the whole country.

Bangkok, the capital and the chief port of Thailand, is situated on the Chao Phraya about 20 miles from the sea. The population of the city is nearly 1.5 million and that of its twin-city, Thonburi, is about 500,000, making a total of about 2 million in the Greater Bangkok area. Thonburi is the industrial part of the metropolitan area, having most of the rice-mills and sawmills and many other factories.

Bangkok is a delta port which suffers from difficult access, as the part of the river below the port is shallow and winding, and has a variable volume of water. There are numerous sand-banks and a great sand-bar across the river mouth. But Bangkok lies on the main distributary of the Chao Phraya river system and thus commands the approach to the most important region in the country, the Central Valley. It enjoys the advantage of having a rich and vast hinterland. The railway system and the Chao Phraya river system provide vital transport links with the Northern Region and the Korat Plateau, which thus form the wider hinterland of the port. The hinterland of Bangkok extends to the land-locked country of Laos.

Bangkok is the single great focus of land, sea and air routes in Thailand. The railways, the rivers and canals, the national highways, the coastal and international shipping services, and the domestic and international



air routes, all focus on Bangkok. This is partly because Bangkok occupies a central position in relation to the longitudinal extent of the country which is about 1,000 miles from north to south.

As a port, Bangkok does not have adequate harbour and docking facilities. Owing to the great bar at the river mouth, large ocean-going ships of more than 10,000 tons must lie outside the river mouth and goods have to be discharged or unloaded by sailing junks or lighters. The harbour has to be constantly dredged by a 'fleet' of dredges. However, the expansion and modernisation of Bangkok Harbour are being carried out and plans to build a new and larger harbour some 50 miles to the south have been put into operation.

Bangkok handles some 98% of the import trade and about 65% of the export trade of Thailand. A law has made it compulsory for almost all imports to be channelled through Bangkok. Bangkok is also the most industrialised city in Thailand. In and around Bangkok are concentrated most of the major industries of Thailand, including both the traditional rice and teak milling and the modern manufacturing industries.

As the largest and busiest international air centre in South-East Asia, Bangkok plays an important part in the substantial tourist trade enjoyed by Thailand.

Chiangmai, the second largest town in Thailand, has a population of 66,000 people. It is situated on the Ping river and serves an important agricultural area in the Northern Region. It is one of the centres of the teak industry, where teak rafts are prepared and sent down the river to Bangkok.

Ayuthaya, one of the more important of the smaller towns of Thailand, is a river port on the Chao Phraya. As a former capital, it is an historic town. It is also

an important railway centre on the railway to the Northern Region and the railway to Koral. As a market town, it serves an important agricultural area. But its population is small, numbering only 32,000.

Transport

Railways

The transport system of Thailand has not been very greatly developed, but considerable



SOUTH-EAST ASIA

improvements have been made in recent years. In a large country like Thailand, the total railway mileage of 2,235 miles is not very adequate.

The main railway lines radiate from Bangkok. The Southern Line runs southwards to the West Malaysian border. It serves the tin and rubber areas of Peninsular Thailand. The Eastern Line runs to the Cambodian border, where it is linked with the Cambodian railway to Phnom Penh. The Northern Line links Chiangmai in the Northern Region with the capital. This line serves the important Central Valley.

The Korat Plateau is served by the North-East Line. This connects Bangkok and Ayuthaya with Nakhon Ratchasima (Korat town), where the line splits into two branches. One goes eastwards to Ubon, and the other leads to Udon Thani, with an extension to Nong Khai. A ferry across the Mekong enables Vientiane, capital of Laos, to be linked to the Thai railway system. A large part of the overseas trade of Laos is channelled via Nong Khai and the Korat railway through the port of Bangkok.

Road Transport

Modern road transportation is not so widely used in Thailand as rail transportation.

A klong in Bangkok. The picture shows traders plying along the klong trying to sell their produce. This is called a floating market.

Roads suitable for motor vehicles are confined mainly to the larger towns, and many farming areas are far from the major roads, the main waterways and the main market centres.

The total road mileage consists of about 6,000 miles of national highways and 4,300 miles of provincial highways. Only 35% of the total road mileage consists of roads usable in all weather. The rest of the roads are surfaced with stone, laterite or earth. But the Government is spending large sums of money on a Seven-Year Highway Project to construct and improve the road system. Thus a more integrated system will be created to meet modern transportation needs.

Inland Water Transport

Rivers and canals still offer the chief means of transport, especially in the Central Valley. A great number of boats, including sailing-boats, use the network of rivers, canals and streams in the Central Valley. The main 'street' in many a town or village is a klong or canal. The few all-weather roads and the railway only supplement the waterways.

The Chao Phraya is navigable by steam launches for only 120 miles during the dry season, but during the high-water season it is navigable for more than double that distance. Regular all-the-year passenger services are possible only between the main towns along the lower reaches. In the delta region, however, river traffic is possible throughout the year. Most of the paddy harvested is transported by boat to the rice-mills.

In the Korat Plateau and the Northern Region, the people depend mainly on ox-carts as the chief means of transport.

Coastal Shipping

Coastal shipping services are provided

by a Government-owned shipping line and several private shipping companies. The services are mostly channelled through Bangkok. The East Coast ports in Peninsular Thailand lack adequate docking and harbour facilities and sufficient depth for large ships. The port with the best facilities is Songkhla. The West Coast ports carry on much trade with Penang and Singapore.

Air Transport

Air transport is centred on Bangkok, the most important international airport in

South-East Asia. The Bangkok Airport is served by 36 international airlines, almost twice the number operating in Singapore. It is connected by international flights to all the chief cities of the world. Thai Airways operates regular domestic flights from Bangkok to the important towns in the outlying regions. These internal flights are important for linking outlying parts isolated by forests, mountains or floods during the wet season. They also compensate for the poor road system. Thai International Airways operates external flights to the main cities of South-East Asia.

EXERCISES

- Describe the relief and climate of either Thailand or Burma, and explain how these affect the distribution of crops.
- Study the following information concerning Thailand and then answer the questions given below:
 'Only 11% of the total land surface is cultivated.
 About 65% of the total cultivated land is found in the Menam Chao Phraya Valley
 About 92% of the total cultivated area is under rice.'
 (a) Why is well over half the total cultivated land found in the Menam Chao Phraya Valley?
 (b) Why is so much of the cultivated land devoted to padi-growing?
 (c) How is the remaining land used?
- Describe the physical geography of either Sumatra or Thailand. Use the headings: relief; drainage; climate; vegetation.
- Divide Thailand into its main natural regions, and describe each of the regions. Illustrate your answer with a sketch-map.
- Compare and contrast the geography of Thailand with that of Burma.

Chapter 17

Indo-China



Indo-China is a convenient term for a group of states in mainland South-East Asia formerly under French rule, namely, South Vietnam, North Vietnam, Cambodia and Laos.

Relief

The region consists of four major relief zones:

1. The Northern Highlands and the Annamite Chain together form the largest of the four zones. It stretches from the uplands of north Tonkin, through the extensive Laos Plateau, and extends southwards as the Annamite Chain almost to the Mekong delta.
2. The eastern deltas, including the Red river delta in the north, the Mekong delta in the south and the smaller deltas along the east coast.
3. The Cambodian plains which merge with the Mekong delta.
4. The Cardamom and Elephant Mountains in the south-west of Cambodia.

Only the first relief zone, comprising the Northern Highlands of Indo-China and the Annamite Chain, will be described here, as this extensive zone includes territories in all the four countries in Indo-China. An account of each of the other three relief zones will be given in the separate descriptions of the three countries concerned.

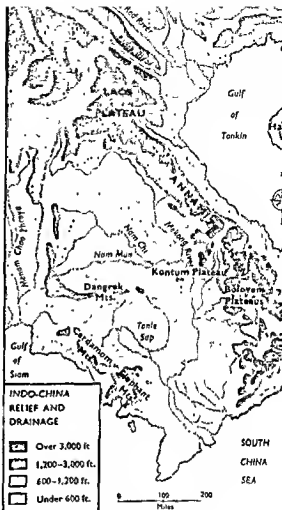
THE NORTHERN HIGHLANDS

The Northern Highlands of Indo-China are

the southern extension of the great Yunnan Plateau of China. North of the Red river in Tonkin, the highlands consist of mountain ranges of moderate heights and plateaus of limestone and sandstone. These highlands form a watershed between the rivers flowing to the Red river and those flowing to the Si Kiang drainage system in South China. Most of the rivers in the northern Tonkin highlands flow through deep gorges, and the mountains generally present a barren appearance owing to the widespread cutting down of trees. The high proportion of poor limestone country has made these highlands capable of supporting only a moderately sparse population. The region is peopled mainly by hill tribes.

Between the Red river in Tonkin and the Mekong river is an extensive highland area with greater average heights than the northern Tonkin uplands. The highlands in the west of Tonkin and the adjoining eastern part of Laos are a series of high mountain ranges with a north-west — south-east trend. The ranges are largely composed of limestone, which has given rise to a rugged, barren karst landscape. Most of this mountainous area is also very inaccessible, so that it is one of the most sparsely populated areas in South-East Asia.

To the west, between the Laos-Tonkin border and the Mekong river, lies the great Laos Plateau. This is dissected by many deep river gorges into smaller plateau blocks and overlaid with folded mountain ranges rising above the general plateau level. Large parts of this rugged upland region are between 3,000 and 6,000 feet in elevation, with several peaks reaching beyond 8,000 feet. The region supports a scanty population consisting of different groups of Thais occupying the river valleys and hill tribes living at different altitudes. Some tribes



occupy sites above 3000 feet. There are, however, many large areas which are practically uninhabited.

THE ANNAITE CHAIN

The Northern Highlands of Indo-China continue southwards as the Annamite Chain, a broad and continuous stretch of uplands between the Mekong and the South China Sea. The higher eastern edge of the chain follows the bulge of the eastern coastline.

The chain stretches almost to the Mekong delta in the south. Its eastern slopes generally present a steep front to the East Coast, but its western slopes dip gently through Laotian and Cambodian territory towards the Mekong.

The greater part of the uplands is between 600 and 3,000 feet, but a number of mountains and mountain ranges, mostly occupying the eastern side of the chain, rise to between 3,000 and 6,000 feet, with several peaks exceeding 6,000 feet.

The mountain ranges rest on a large platform of very ancient rocks. The southern half of the chain comprises the most ancient part of the basic structure of mainland South-East Asia. Vertical earth movements at different times in the distant past resulted in widespread faulting and uplift. A number of plateau blocks were created, marked by frequent faults. Through these faults basaltic lava poured out under pressure. The extensive outpourings of basalt cover many parts of the chain, especially the surrounding areas. The volcanic rocks have weathered to form fertile soils in the "red lands" of the plateaus of Bolovens (in the south of Laos), Kontum and Darlac (in the western part of central Vietnam) and in the foothill region to the north of the Mekong delta.

From the Annamite Chain a number of high spurs and perpendicular mountain walls jut towards the sea. These break the continuity of the East Coast plains and separate the coastal deltas which communicate with one another through mountain passes.

The interior highlands are rugged and heavily dissected. Malaria is widespread in many parts. These facts, together with the great height of the mountain ranges, make the Annamite Chain a great barrier to

movement between the East Coast region and the Mekong Valley in the west of Indo-China.

The Mekong River

Another important geographical feature to note is the Mekong river which flows through Laos, Cambodia and South Vietnam. The Mekong is the largest and longest river in South-East Asia and the most important river in Indo-China. It forms part of the dividing line between Laos and its neighbours, Burma and Thailand. It flows through Cambodia and South Vietnam. Near Phnom Penh it divides into two main distributaries. Both distributaries sub-divide into smaller branches before reaching the sea. North-east of the Mekong delta, other rivers, the Saigon river, the Western Vao and the Eastern Vao, form a delta which is continuous with the Mekong delta.

The Mekong is vital to the life and economy of Laos, Cambodia and South Vietnam. The Mekong Valley and the tributaries in Laos provide the main agricultural land and irrigation water that support the farmers of Laos. The people in the Cambodian plains depend on the floodwater of the Mekong for their farming. Tonle Sap, which is abundant in fish, also depends on the seasonal supply of water from the Mekong. Soil fertility in the Mekong delta results in the abundance of rice harvests.

The Mekong is also a great waterway which is navigable for fairly long stretches. When peaceful conditions return to Indo-China, the plans to make use of the water and power of the Mekong through the great international Mekong Project can be carried out. The greatly increased usefulness of this large river would benefit millions of people in Indo-China.

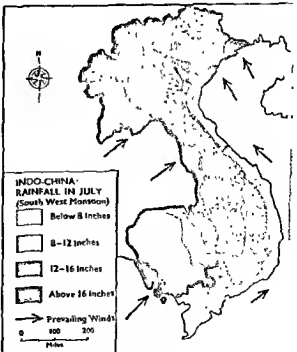
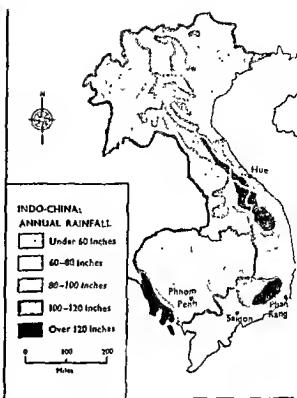
Climate

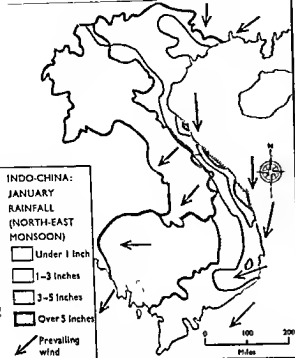
As Indo-China is situated between latitudes $8\frac{1}{2}^{\circ}$ and 23° N and lies in the paths of the seasonal changes of air-streams operating in South-East Asia, it experiences the tropical monsoon climate similar to that of Burma and Thailand. The alternation of the wet South-West Monsoon and the drier North-East Monsoon determines the pattern of life in the region.

From mid-May to October, air-streams from the south and south-west bring high temperatures and heavy rains to most parts of the region. The heaviest rainfall occurs in July and August, except in the eastern valleys that are in the rainshadow of the Annamite Chain. Typhoons occur from July to November. Typhoons from the east, though not very frequent, can cause severe damage and bring heavy rainfall and serious floods to the exposed East Coast, especially the northern and central areas.

In most areas, the amount of rainfall during the South-West Monsoon season represents about 80% of the total annual rainfall. In Saigon, for instance, 71 inches of rain out of the total of 81 inches is received from May to October. The Cardamom Mountains of Cambodia and the areas of high relief in the Annamite Chain receive very heavy rainfall of over 160 inches a year. But the areas lying in the rainshadow of the highlands experience much drier conditions. Such areas include the greater part of the Cambodian plains and parts of the Mekong and Tonkin deltas, where the annual rainfall is 40-60 inches, e.g. Phnom Penh, 47". Although the East Coast plains are in the rainshadow of the Annamite Chain, their annual rainfall is higher because they receive rain during the North-East Monsoon season e.g. Hue, 116".

During the North-East Monsoon season,





from October to February or March, air-streams from the north and north-east bring cool weather and some rainfall to North Vietnam, the East Coast and the eastern slopes of the Annamite Chain, and the Cardamom Mountains of Cambodia. Other parts of Indo-China, however, have a dry weather that is cool but sunny.

The cool weather rainfall along the East Coast decreases rapidly south of Hue in central Vietnam. Towards the south, in the area around Phan Rang, little rain is brought by either monsoon. The annual rainfall in this dry zone is only about 25 inches.

For farmers the changes in the amount of rain are just as important as the alternation of wet and dry seasons. Often an unusually long drought is followed by an exceptionally wet spell accompanied by disastrous floods.

Vietnam

Vietnam is a long narrow strip of land

shaped like the letter 'S'. Beginning in the north, the S-shaped coast of Vietnam curves round the Gulf of Tonkin, then bulges out into the South China Sea, and finally curls its tail-end into the Gulf of Thailand.

The territory of Vietnam was partitioned in 1954 into North Vietnam and South Vietnam, each under its own Government. The partition line roughly corresponds with the 17°N latitude, popularly called the 17th parallel. South Vietnam occupies slightly more than half the territory, about 65,950 square miles, while the area of North Vietnam is less than 60,000 square miles.

The relief of Vietnam is marked by the contrast between the deltas in the north, south and along the narrow East Coast, and the backbone of mountain ranges and plateaus in the interior. North Vietnam is important for its deltaic plain, formed as a result of the silting of a shallow gulf. This plain, the Red river delta, merges southwards with a long narrow corridor shared between North and South Vietnam. The Annamite Chain fringes the western side of this coastal region. Several perpendicular offshoots of the Annamite Chain jut towards the sea and break the continuity of the coastal plains.

About 100 miles south of the 17th parallel, Vietnam broadens out once more to include more mountain and plateau area, but the coastal plains become narrower and more walled in by the highlands of central Vietnam. About 50 miles north-east of Saigon the high terrain descends to foothills, south of which begins the great alluvial plain of the south. This southern region is drained by the distributaries of the Mekong and other rivers to the north of the Mekong delta. The Mekong deltaic plain has been formed as the result of the silting of a gulf and the

rise of a shallow submarine platform. Except for a few peaks in the north and the east, the whole of the southern region consists of one vast unbroken plain which is seldom more than a few feet above sea level.

NORTH VIETNAM

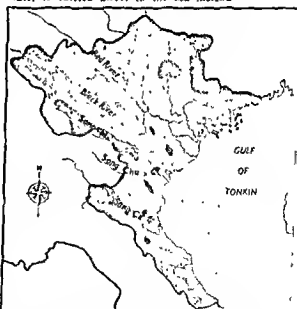
The Democratic Republic of Vietnam, or North Vietnam, has a smaller total area than South Vietnam (the Republic of Vietnam). Its area is less than 60,000 square miles, as compared with South Vietnam's area of 65,950 square miles, but its population is greater. North Vietnam's population is about 20 million, as compared with South Vietnam's 17 million. The people of North Vietnam are mostly crowded into the Tonkin deltaic plain and the small delta areas in the northern section of the East Coast plains.

As the greater part of Tonkin consists of uplands, the Tonkin lowlands are relatively limited in extent. The Red river delta, the main part of the Tonkin lowlands, measures only about 5,800 square miles. This is much smaller than the other two great lowland areas in Indo-China, namely, the Cambodian plains and the Mekong deltaic plain. In spite of its smaller size, the Red river delta, with the adjoining lesser deltas to its south, forms the most important agricultural region in the whole of Indo-China. Agriculture here is intensive and population densities are high.

The Tonkin delta area is very low-lying and flat, mostly below 10 feet above sea level. It is built up of river alluvium deposited by the distributaries of the Red river and many smaller rivers from the northern Tonkin highlands. The deltas of the rivers to the south, the Song Ma, Song Chu and Song Ca, merge with the main

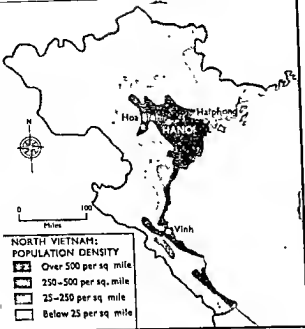
delta, thus enlarging the Tonkin deltaic plain.

Along the Red river and its distributaries many embankments or dykes have been built. The elaborate methods and use of dykes feature more prominently here than in other padi-growing regions in mainland South-East Asia. The major embankments not only help to control and regulate the severe seasonal floods of the rivers, but also provide drier sites for settlement. Both modern and primitive methods of irrigation are practised. About one-third of the total padi acreage is served by modern irrigation works such as dams and perennial canals. With all these facilities, the farmers are able to carry out a very intensive form of agriculture. But as a result of the building of the dykes, much of the silt in the river water is carried direct to the sea instead



NORTH VIETNAM: FORESTS AND MAIN CROPS





of being spread over the farmland and enriching it. The Tonkin farmers, however, follow the Chinese methods of manuring their farms with human and animal excreta to restore the soil fertility lost by continual cropping.

The rainfall in the region occurs mainly during the South-West Monsoon season, but in winter the North-East Monsoon winds, which have crossed the Gulf of Tonkin, and occasional cyclones from the South China Sea bring some rainfall. As the winter temperatures are below 70°F, there is a low rate of evaporation and the light winter rainfall of 5 to 6 inches from December to March is important in enabling a second crop of padi to be raised. The rainfall occurs as a steady drizzle with practically no run-off and wastage, and as such is effective. About half the acreage under padi is planted with two padi crops a year. Much of the remaining farmland, especially the slightly higher land between the low-lying areas, is used for growing a 'dry' crop of maize, sweet potatoes or beans during the drier

season. The smaller dykes and the bunds surrounding the fields are used for planting mulberry trees and fruit trees.

With such an intensive form of agriculture in fertile alluvial soils and in favourable climatic conditions, the Tonkin deltaic plain supports very high population densities. The average density is about 1,500 per square mile, but in the most fertile areas of newer alluvium near the main rivers, the densities reach 4,500 per square mile. The densities are so high and the extent of agricultural land is so limited that there is serious overcrowding in many parts of the Tonkin lowlands.

A narrow stretch of coastal plains extends all the way from the Tonkin lowlands to the Mekong deltaic lowlands in the south. It consists of deltas separated by high offshoots of the Annamite Chain. There is a heavy rainfall of 80-120 inches in the northern section of the East Coast, which lies within North Vietnamese territory. The rainfall is brought mainly by the North-East Monsoon winds, but there is also some rainfall during the South-West Monsoon season. With adequate rainfall and the slightly higher winter temperatures, three crops of padi can be grown a year. The cultivation is very intensive owing to the shortage of fertile land and the rapid population growth.

The economic life of North Vietnam is organised on Communist lines, with collective agriculture and state industries. The farms are run as collective farms or state farms. In spite of the new emphasis on industries, the population depends mainly on agriculture for a livelihood. Most of the 7½ million acres of cultivated land is under padi. The total annual output of rice is about 5½ million tons. This is barely sufficient to feed the large and growing population. To supplement the rice output, maize and sweet

potatoes are grown in the slightly higher or drier areas which are less suited to wet padi, as well as in the winter season as a second crop. Sufficient quantities of maize are produced to leave a large surplus for export to East European countries.

Other crops include sugar-cane, ground-nuts, coffee, tea, tobacco, jute and rubber. The output of sugar has expanded. Coffee and tea are grown in the upland "red lands", near Vinh in the northern part of the East Coast plains. Groundnut crops are raised in the Red river delta. Sufficient tobacco is grown to enable the state factories to produce some 65 million packets of cigarettes a year. A little rubber is produced in the foothills of the Annamite Chain.

Mineral Resources

In mineral resources North Vietnam is better endowed than South Vietnam. About 2 million tons of coal is produced annually, mostly from the Quang Yen coalfield to the north-east of Haiphong. Much of the coal is of good quality and includes the best coking coal mined in South-East Asia. A large part of the coal is exported, mostly to France and Japan.

The next most important mineral is apatite, or phosphate of calcium. Between 600,000 and 700,000 tons of apatite is produced each year, mostly from the Lao Kay area to the north-west, near the Laotian border. Of the other minerals, small quantities of tin and chromite are produced. The tin ore is obtained from the far north, near the Chinese border, while chromite is mined in the highlands to the south-west of Vinh.

Industries

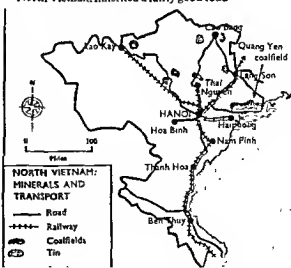
There had been some industrial development before the Partition in 1954. Under

the present Government, much more emphasis is placed on industrial development. There is a wide range of industries, which are mostly located in Haiphong and Hanoi. In recent years some new factories, mostly small ones, have been set up with the aid of friendly Communist countries, e.g. Communist China and the U.S.S.R. These include iron and steel works, engineering works, a power-station, a tea factory, and factories manufacturing bamboo-pulp and paper, fertilizers, textiles and rubber goods. The new steel works are located at Thai Nguyen to the north of Hanoi, and at Yen Bai, situated on the Red river some 75 miles to the north-west of Hanoi.

The annual output of textiles is now about 95 million yards, and that of cement has doubled in the last few years to 450,000 tons. The output of electricity has also been increased considerably to meet the growing needs of industries. The Government has encouraged the setting up of industries in towns other than the two main cities of Hanoi and Haiphong, and also in the rural areas.

Transport

North Vietnam inherited a fairly good road



system from the French, but the railway system is inadequate. The railways, with a total length of 820 miles, are centred on Hanoi. One line runs southwards from Hanoi to Thanh Hoa. Another railway goes north-westwards along the Red river valley to Yunnan in China. It passes through the new steel centre at Thai Nguyen. A north-eastern line joins Hanoi with Nanning in South China. There is also a short line connecting Hanoi with its outport, Haiphong.

There is a network of more than 6,000 miles of all-weather roads, including a trunk road along the East Coast to the 17th Parallel. Water transport is also very important. About half the commercial freight traffic is carried along the many navigable rivers and the close network of canals.

Trade

Some three-quarters of the external trade of North Vietnam is conducted with Communist countries, especially Communist China, Czechoslovakia and the U.S.S.R. Coal accounts for about 40% of the total export value. Cement and other mineral products are also exported. The chief imports include machinery, petroleum, steel, textiles and chemicals.

Towns

Hanoi (650,000) is the cultural and commercial centre as well as the capital of North Vietnam. It is situated on the Red river about 100 miles from the sea and near the head of the river delta. It occupies a central position in the Tonkin lowlands and is thus well placed to be the nerve centre of the road, rail and inland waterway systems.

Haiphong (375,000), the chief port and main industrial centre, is situated near the mouth of the northern tributary of the Red river. Its industries include tin-smelting,

shipbuilding, rice-milling and the manufacture of cement, textiles, plywood, glass, pottery and other products. The important cement industry of Haiphong is based on the nearby supplies of coal and limestone. Haiphong is not only the main outlet for the produce of North Vietnam, but is also an outlet for goods from Yunnan in China. As a delta port, however, Haiphong is not easily reached by large ships and its harbour is lacking in depth.

SOUTH VIETNAM

The Republic of Vietnam, or South Vietnam, includes a large part of the Annamite Chain, a portion of the East Coast plains longer but narrower than the portion in North Vietnam, and the Mekong deltaic plain in the south, which is more extensive than the Tonkin lowlands. The total area of South Vietnam is 65,950 square miles, more than half the area of the whole of Vietnam. But its population of 17 million is smaller than that of North Vietnam. Included in this population are about a million refugees who fled from Communist North Vietnam.

South of the 17th parallel, the central and southern parts of the East Coast plains lie in South Vietnamese territory. They are often called the Central Vietnam Lowlands. These coastal lowlands are narrower and more isolated than those in the north. The rainfall diminishes rapidly south of Hue. This is because the North-East Monsoon winds which reach the mountain barrier in the northern part of the coast are deflected southwards, and they become progressively drier as they drop their moisture in the more northerly areas. In the central section the annual rainfall is 60-80 inches, but the amount decreases in the southern section.

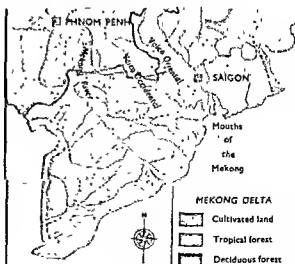
where there is only 25 inches a year at Phan Rang. In midsummer, when the South-West Monsoon descends from the Annamite Chain to the coast, it has a warming and drying effect. The hot and dry winds are a danger to crops. In spite of these handicaps, two crops, and at places even three crops, are raised a year with the aid of irrigation, especially in the more fertile areas in the central section of the coastal plains. The cultivation is very intensive as far south as Binh Dinh. Besides padi, sugar-cane is cultivated, and fishing is important along most of the coast.

In the Central Vietnam Highlands or the Annamite Chain, agriculture is mostly of the shifting type practised by some hill tribes. In the eastern foothills, some areas are planted with tea and coffee in plantations and smallholdings. Considerable areas in the southern foothills are devoted to the planting of rubber as well as coffee and tea. A recent agricultural development is the opening up of re-settlement areas in the western plateaus. These areas are mostly in the fertile 'red lands' between 1,200 and 3,000 feet. The settlers are mostly from the overcrowded East Coast Plains but they also include refugees from war-stricken areas. They grow fibre-crops such as kenaf and ramie and other cash crops such as tea, coffee, rubber and fruits, as well as food crops of the drier type, including hill padi, maize and sweet potatoes. The re-settlement areas are around Kontum, Pleiku and Ban Me Thuot. An extensive road building programme has been launched with American aid to serve these remote areas.

South of the Central Highlands is the huge Mekong deltaic plain. The Mekong delta begins just south of Phnom Penh in Cambodia, where the Mekong divides into two branches. The two main distributaries,

particularly the northern one, sub-divide into several channels before reaching the sea. North of the delta proper, other rivers, including the Saigon river, the Western Vao and the Eastern Vao rivers, form a combined delta which is continuous with the Mekong delta. The upper part of the Mekong delta lies within Cambodian territory.

The Mekong is subject to more serious floods than the Red river, as the Mekong is a much larger river. There have been fewer attempts than in North Vietnam to control the floods of the Mekong by building major embankments. The French built a large system of canals to drain off the water and provide navigation waterways, but the drainage canals are not adequate. As the floodwater during the high-water season is deep in many areas, the methods of padi cultivation resemble those of Thailand. Many South Vietnamese farmers depend largely on floating-padi which is sown broadcast without going through the nursery and transplanting process. This type of tall padi has stalks measuring as much as 18 feet.



SOUTH VIETNAM:

MAIN CROPS

-  Rice
-  Rubber
-  Coffee
-  Tea

0 100

Miles



SOUTH
CHINA
SEA

In the Mekong delta there are large areas which are less fertile than the Red river delta. There is also less rainfall during the cool season, only 38 inches in Saigon from December to March. With the higher temperatures and higher rates of evaporation, it is not possible to grow a second padi crop as in Tonkin. There is also less population pressure than in the Red river delta. All these conditions lead to the land being farmed more extensively but less intensively than in Tonkin.

In spite of this, the Mekong deltaic plain is a great padi-growing region. Padi is grown not only on a subsistence basis, but also as a cash crop, and several million tons of rice is produced annually. But the intensification of the war in the country

has caused the production to drop and the exports of rice to cease. Normally, there would be a large surplus for export, as the population density is not very high. The greater part of the total South Vietnamese output of rice is produced in the Mekong deltaic plain.

The economy of South Vietnam is more dependent on agriculture than that of North Vietnam, as the mining and manufacturing industries are less developed. When Vietnam was partitioned in 1954, about 65% of the total padi acreage and nearly all the rubber plantations were included in South Vietnam. But practically all the mineral resources and mining areas and most of the factories and industries were within the borders of North Vietnam.

Since the Partition, agriculture in South Vietnam has made good progress and the acreage and production of padi and rubber, the chief crops, have greatly expanded. But the long years of war and the intensification of the war since 1965 have caused serious setbacks. Farms in many areas have been abandoned as thousands fled to the cities for safety. About half the rice-mills have ceased operations, and attacks have been made on sugar-mills and other factories. This has made it necessary to import sugar when previously a state of near self-sufficiency existed.

However, there has been a general increase since 1954 in the acreage under padi, from 4.9 million acres to about 6 million acres. The rice production has expanded from 2.5 million tons to nearly 5 million tons, which is almost a 100% increase. But owing to a rise in the population and a serious reduction in rice-milling operations, the export of rice has recently stopped, and indeed some rice has had to be imported from abroad. This has cut out one important

source of export earnings.

The expansion of the area under rice cultivation has been brought about by several major agricultural schemes. These are linked with schemes to settle the large number of refugees from the Communist North, and to re-settle people from the overpopulated Central Vietnam Lowlands. There have been several projects carried out in parts of the delta which have not been cultivated, especially in the western, southern and north-central portions of the delta. The high plateau project mentioned earlier was launched partly to diversify the agriculture. These projects have resulted in increased production of rice and other crops.

Rubber now remains as the principal export crop and the main source of foreign exchange. Although there is a decline in the rubber output, owing to manpower shortage, there has been a general increase in the acreage and annual production since 1954. The total acreage under rubber is 320,500 acres and the annual production of rubber is about 65,000 tons. The chief rubber-growing areas are along the valleys of the Saigon river and the Dong Nai river and in the red-earth uplands, to the north of the Mekong deltaic plain.

Coffee and tea are mainly plantation crops grown in several parts of the country, including the red-earth uplands in the northern provinces of Quang Tri and Quang Nam near the 17th parallel. The sugar-cane crop, which occupies about 24,000 acres, produces a million tons of cane a year. It is grown in the Saigon valley, the Vaico valley, the Dong Nai valley and some parts of the Central Vietnam Lowlands. South Vietnam recently produced most of its annual needs of 150,000 tons of sugar, but owing to the damage to sugar-mills, some 50,000 tons of sugar have to be imported

from Taiwan and Thailand.

The secondary food crops include sweet potatoes, maize and tapioca. In some provinces, the production of sweet potatoes and maize has increased because of the need for fodder in pig-breeding.

Kenaf, a jute substitute, has increased three times in acreage, especially in the highland re-settlement areas. The additional supply of kenaf and the old production of jute meet most of the country's needs for gunny-bags and twine.

Livestock

There are about 1.8 million buffaloes and cattle and 3.5 million pigs in South Vietnam. In some areas, especially the Central Vietnam Lowlands, farmers have given up their stock-rearing activities to settle in cities. But pig-rearing has advanced with the assistance of the Government which launched a pig-corn programme to encourage the breeding of pigs fed with maize. The number of pigs has increased from 2.3 million to 3.5 million in ten years, and there is some export of pigs to Hong Kong and Malaysia.

Fishing

There has been a large growth in the size of the fishing fleet from 35,000 to 58,000 boats, including a large number of motorised boats, many of which have been supplied by the United States. More than three-quarters of the catch consists of marine fish. There are ten fish-breeding centres from which young fishes are distributed to breeder-farmers to stock their inland fish-ponds.

Minerals

South Vietnam is poorly endowed with mineral resources. Some good coal has been produced at the Nong Song mine to

the south-west of Danang, but the production has stopped owing to transport difficulties and enemy activities.

Industries

Before the Partition, the South was supplied with most of its requirements for manufactured goods from the more industrialised North which received, in return, part of the surplus rice from the South. After 1954, South Vietnam had to depend on overseas sources for most of the manufactures needed, as there were very few industries in the country. Apart from the large rice-milling plants at Cholon, the twin-city of Saigon, and a number of sugar-mills, there were only small industries producing consumer goods such as soft drinks, beer, cigarettes, matches and handicraft industries producing textiles, pottery, sandals and other such goods.

Since then, however, much progress has been made in industrial development, which is remarkable in view of the long years of war the country has been undergoing. There are no large reserves of good coal, iron-ore and other minerals for developing large-scale heavy industries. The light manufacturing industries turn out several types of goods which were formerly imported.

Apart from the coal that had been produced from the Nong Song mine near Danang until the production stopped recently, an important source of power is the hydro-electric power plant at Da Nhim, near Dalat. When this is in full operation, it will supply all of South Vietnam's industrial needs for electric power.

Because of the war most industries are clustered in and around Saigon, with some factories scattered in other areas such as Danang, Ha Tien on the south-west coast, the industrial estate in Bien Hoa to the north-

east of Saigon, areas along the newly-constructed Saigon-Bien Hoa Highway, and the Cam Ranh Bay area to the north of Phan Rang.

The textile industry has achieved marked progress. It now produces about 90% of the country's needs and its expansion is continuing. The imports of textiles have dwindled, but to feed the growing textile industry increasing quantities of cotton yarn from the United States and rayon yarn from Taiwan are imported. The production of gunny-bags has increased from less than 2 million to 3-4 million in the last few years.

Other modern industries include the manufacture of rubber goods, cement, paper, chemicals, plastic goods and electrical equipment. Among the rubber goods manufactured are tyres and tubes, shoes, sandals, foam mattresses, hoses and rubber mats. Several factories in Saigon and the Bien Hoa Industrial Estate manufacture all types of paper products, including high-quality paper. Plastic goods are made in more than 70 factories. The young chemical industry produces cement, fertilizers and various chemicals. An oil-refinery has been set up at Nha Trang, about 50 miles north of Phan Rang. The manufacture of cement is important in Ha Tien where there are huge limestone reserves in the neighbouring mountains.

The light engineering industries have also been developed. They have produced the plants for more than 500 rice-mills of all sizes and also automatic looms for the textile industry. There are factories for assembling sewing machines, motor cycles and passenger and freight railway cars.

Many industrial enterprises are controlled or operated by the Government. They range from the making of aerated-water to the manufacture of cement, paper and textiles

Trade

Before the spread of the war in 1965, there had been an expansion of the export trade due mainly to a large increase in the exports of rice and rubber. But since then the exports of rubber have declined and rice exports have come to a halt. Rubber is exported mainly to France, West Germany, Japan and the United Kingdom. There has been an increase in the exports of secondary agricultural products and marine products. Tea ranks second to rubber, with the United Kingdom as the principal buyer. Other exports include groundnuts and groundnut oil (sold mostly to Singapore and Hong Kong), shrimps and shell-fish (Japan), feathers for making sleeping-bags and bedding (West Germany and the United States), cinnamon, coconut oilcake and coconut oil. The less important exports are cattle, pigs, kapok and eggs.

South Vietnam conducts an export trade with France, the traditional partner, West Germany, Singapore and Hong Kong.

IMPORTS

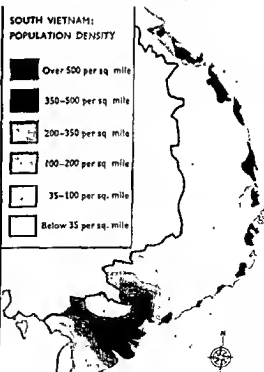
The volume of imports has been increasing so much that the total value of imports greatly exceeds that of exports. The most important imports are iron products, machinery, wire, petroleum products, milk products, electrical equipment and chemical products. The United States is the chief source of imports, mainly in accordance with the terms of certain American aid agreements. Next to the United States, the main suppliers are Taiwan, Japan, South Korea, Malaysia and France.

Machinery, metals, milk products, wheat flour, chemical products, fertilizers and cotton yarn are imported mostly from the United States. Taiwan is the chief source of sugar and cement. Petroleum products come

from Malaysia, Indonesia, Singapore and Iran.

Population

The population of South Vietnam is about 17 million and the average population density is 250 per square mile. The heaviest concentrations of population are in the Mekong deltaic plain, where the average density is more than 350 per square mile. The central part of the plain, between Saigon and the main Mekong distributaries, has the highest densities of more than 500 per square mile. Such densities are, however, much lower than in the most densely populated parts of the Tonkin lowlands. In the marginal areas surrounding the central parts of the Mekong delta,



the densities are only between 100 and 200 per square mile.

The chief factors that favour the high population densities in the Mekong deltaic plain are the large extent of flat and low-lying alluvial land with fertile soils suitable for padi growing, and the ample facilities for irrigating the padi crops with floodwater from the Mekong or with water from irrigation canals. The areas away from the central parts are less fertile and are less densely populated because there has been little population pressure. Among them are areas which have been only recently opened up and settled.

In the Central Vietnam Lowlands there are patches of fertile alluvial deltaic areas which are very densely populated. But because the highlands which separate them are unsuitable for wet padi cultivation, the average population density of the region as a whole is only about 200 per square mile, which is lower than in the Mekong deltaic plain. In the northern coastal deltas, where double cropping of padi is practised and the agriculture is more intensive, the population densities are much higher than the average figure.

The Annamite Chain is the most thinly populated region in the country. This upland region is rugged, heavily dissected and not easily accessible from the coastal lowlands. Malaria is common in many parts. These factors have discouraged settlement. But the recent development of certain "red land" areas has brought more settlers to the region. Outside these settlements, large areas are sparsely inhabited by non-Vietnamese hill tribes. The average population density of the region as a whole is only 35 per square mile. The least populous provinces (Quang Duc, to the west of Dalat, and Phu Bon) have only 20 per square mile.

Towns

The most important city is *Saigon*, the capital, the chief port and the main commercial and industrial centre of South Vietnam. Saigon and its twin-city Cholon are under one administration. In Cholon there is a large group of Chinese businessmen and industrialists. The total population of the greater Saigon area is about 2½ million. This includes a large number of war refugees.

Saigon is situated on the Saigon river about 50 miles from the sea. Its position some distance away from the main river of the country is similar to that of Rangoon in Burma. One important advantage is that Saigon is spared the serious floods from which the main delta suffers. Besides, the rivers in the Mekong delta proper are difficult for large ships to navigate, but the Saigon river can be navigated by large ocean-going ships as far as Saigon. Although the city is not on the Mekong, it is connected by creeks to the main river and is thus able to serve as the main outlet for the produce of the deltaic region. The connection with the Mekong extends Saigon's hinterland to include parts of Laos and Cambodia.

Saigon is well placed to be the focal point of transportation and communication routes from the three component regions of the country. As the capital of the country and with its numerous geographical advantages, Saigon has attracted many industries, including both the traditional industries such as rice-milling and many newer industries. In fact, most of the industries of South Vietnam are concentrated in Saigon and its suburbs.

Danang (145,000), the main port on the east coast, handles mostly coastal traffic, as its harbour is not deep enough for large ocean-going ships.

Transportation

The total railway mileage in South Vietnam is only about 875 miles. The main railway line runs from Saigon northwards along the east coast. It used to extend to Hanoi, but now it stops south of the 17th parallel. There are two branch lines, one from Saigon to Loc Ninh in the southern uplands near the Cambodian border, and the other from Phan Rang to the hill-station of Dalat.

There is a fairly good network of some 15,000 miles of roads, of which about two-thirds are paved. The roads fan out from Saigon, and serve not only the delta region, but also the East Coast plains and the central highlands. There has been a vast programme of road building to serve the re-settlement areas in the central highlands. There is also a road from Saigon to Phnom Penh in Cambodia and one to Vientiane in Laos. The road to Laos is usable only during the dry season.

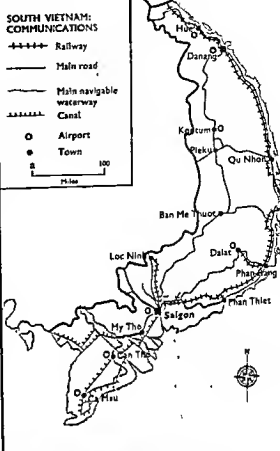
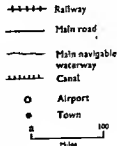
There is, too, an inland waterway system consisting of 1,430 miles of primary canals and 715 miles of secondary canals in the Mekong delta region.

The Government-owned Air Vietnam operates domestic air services from Saigon to Hue, Danang, Dalat, Kontum and other towns in the north, and to Can Tho and Quan Long (Ca Mau) in the south. It runs external services to Vientiane, Phnom Penh, Bangkok, Kuala Lumpur, Singapore and Hong Kong.

CAMBODIA

Cambodia, with a total area of 67,000 square miles, is larger than either South Vietnam or North Vietnam. But it has a much smaller population of about 6.5 million, which is only about one-third that of North Vietnam.

SOUTH VIETNAM: COMMUNICATIONS



Cambodia consists mostly of a huge expanse of lowlands bordered by highlands on almost all sides. The country may be divided into four physical regions: (i) the Cambodian plains, (ii) the Mekong delta, (iii) the Annamite plateau region, and (iv) the south-west mountains and coast.

The Cambodian Plains

This region consists of two main parts: (i) the lowlands surrounding the great lake called the *Tonle Sap*, and (ii) the Lower Mekong lowlands. The two parts are separated by some low hills called *phnoms*. The *Tonle Sap* lowland is a large basin or depression with its lowest portion forming

a huge lake, the Tonle Sap. The name 'Tonle Sap' simply means the Great Lake. The Tonle Sap is a very prominent feature of the Cambodian landscape. During the dry season, from November to June, it is a shallow lake of about 1,000 square miles and the Tonle Sap river flows from the lake to the Mekong river. But during the season when the Mekong is in flood, generally from July to October, the Tonle Sap river flows back to the lake, carrying the Mekong floodwater to swell the lake to more than four times its dry-season size, that is, to more than 4,000 square miles. This annual flooding not only brings floodwater to supplement the insufficient rainfall, but also deposits silt on the margins of the lake and enriches the soils.

The Lower Mekong lowlands in the eastern part of the Cambodian plains are drained by the Mekong and its left bank tributaries. Settlement and cultivation are mostly on the eastern side of the Mekong where the most fertile alluvial flats are located. But this part of the Cambodian plains is relatively undeveloped and sparsely populated.

Except in the south and south-east, the Cambodian plains are surrounded by hills or mountains. In the west, a gap through the border hills provides a passage to the Bangkok Plain of Thailand. In the north, the 200-mile long Dangrek Mountains, which are between 1,000 and 2,500 feet in elevation, mark the border between Cambodia and the Korat Plateau of Thailand. To the east of the Lower Mekong lowlands is a plateau region in the southern part of the Annamite Chain. To the south-west of the Cambodian plains are the Cardamom and Elephant mountains, which separate the interior plains from the south-west coastal plain around Kompong Som Bay. But in the south and south-east, the Cambodian

plains open out to the Mekong delta.

The Mekong Delta

The upper part of the Mekong delta lies within Cambodian territory. From Phnom Penh, the capital of Cambodia, the Mekong branches into two main distributaries and the delta region begins. The Cambodian portion of the delta is an important padi-growing region which supports high densities of population.

The Annamite Chain

East of the Lower Mekong lowlands lie the western plateaus in the southern part of the Annamite Chain. Included in this region are some of the fertile red-earth uplands in the Chain. It is in these areas that rubber, the second main export crop of Cambodia, is grown.

The South-West Mountains and Coast

The Cardamom Mountains and the Elephant Mountains in the west and south-west of Cambodia rise abruptly from the sea and from the Cambodian plains. These rugged and densely forested uplands form an inaccessible and undeveloped region which until recently acted as a barrier and discouraged a direct approach from the interior plains to the sea. Between these mountains and the Gulf of Thailand is a narrow coastal plain which widens out around the Kompong Som Bay. In the small alluvial coastal lowlands, the people plant rice and pepper and engage in fishing. The chief pepper-growing area is around Kampot, which is famous for the quality of its pepper.

Climate

The climate of Cambodia is similar to that of South Vietnam. The South-West Monsoon brings rain from May or June to

October. Heavy rainfall is received in the south-west mountains, but the Cambodian plains and the Mekong delta lie in the rain-shadow of these mountains and receive only 40-60 inches of rainfall a year.

As the South-West Monsoon winds ascend the northern and eastern uplands, they bring slightly heavier rainfall to these areas, which receive 60-80 inches annually.

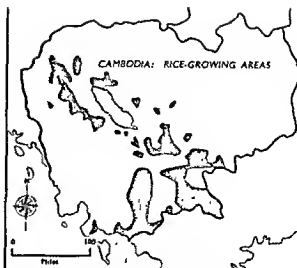
During the season of the North-East Monsoon, the lowlands of Cambodia are on the leeward side of the Annamite Chain and the season is generally a very dry one.

Agriculture

In spite of the very high proportion of lowlands in Cambodia, less than 20% of the total area of the country is under cultivation. Most of the cultivated area is planted with padi. As the population is relatively small, there is a large rice surplus for export after the needs of the people have been met. The annual production of rice is about 2.4 million tons, of which 200,000-300,000 tons are exported annually.

Most of the rice output comes from the upper part of the Mekong delta and the strip of lowlands round the Tonle Sap. As there is insufficient rainfall for growing padi, the crop depends mainly on the floodwater from the Mekong. In many areas where the floodwater is very deep, floating padi with long stalks is planted.

The methods of padi cultivation are generally not very efficient and the yields are low and uncertain. There is a serious lack of facilities for controlled irrigation, proper drainage and flood prevention. Usually only one crop a year is grown. The Government has, however, constructed several irrigation works and restored older irrigation works, while some new works are under construction. In areas where these irrigation



works exist, double cropping of rice is now practised, thus giving increased yields, e.g. in Kompong Cham Province and Siem Reap Province.

Other food crops and minor cash crops are mostly 'dry' crops such as maize, tobacco, cotton, groundnuts and sesamum, which are grown along the levees of rivers and in the unirrigated margins of the lowlands. Some jute is also cultivated in Battambang Province, the chief padi-growing area, for the manufacture of rice-sacks in a factory in Battambang. Most of the jute is grown in small padi farms in the flood plain around Battambang.

Rubber is the most important crop after padi, as rubber exports account for a large part of the export earnings. Rubber is planted in the low plateau region in the eastern part of the country, where the red-earth uplands of the Annamite Chain have sufficient rainfall, fertile soil and good drainage suited to the crop. Most of the annual production of more than 90,000 tons of rubber is exported.

Cattle rearing is a subsidiary occupation of the farmers, but it is an important source of national income, especially in the form of export earnings.

Fishing

Fishing is an important occupation both in the Tonle Sap and along the south-west coast, as well as in rivers, canals, swamps and padi-fields. The Tonle Sap is one of the major fishing lakes in Asia and fishing is an important aspect of Cambodia's economy as fish forms an important item in the diet of the people. Large quantities of freshwater fish as well as salt-water fish from the Gulf of Thailand are dried, salted, smoked or fermented for sale abroad. Most of the fishermen are Cambodians, although recently a number of Chinese and Vietnamese have taken to fishing in the lake. More than half the total catch is sold to dealers at Phnom Penh.

Population

Cambodia's total population numbers about 6.5 million, and its average population density of only about 95 per square mile shows that the country is relatively thinly populated. About 75% of the total area of the country is arable, but only 20% is cultivated. Thus the population is concentrated in less than one-fifth of the country, while the rest of the territory is uncultivated

and sparsely inhabited.

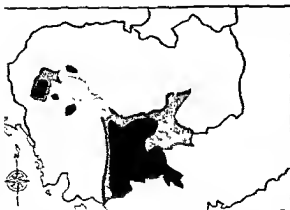
The highest population densities are found in the region which stretches from the South Vietnamese border to the lowlands near Kompong Chhnang and Kompong Cham. Around the Tonle Sap, the population occupies only the narrow, drier belt between the marshes and the surrounding hills. The Cambodian portion of the Mekong delta has the highest population densities of over 500 per square mile. Around the Tonle Sap, the densities are less than 100 per square mile in the flooded zone. Elsewhere the densities are very much lower, mostly well below 50 per square mile. In fact, much of the lowlands of Cambodia is little cultivated and very sparsely populated.

Towns

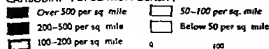
Phnom Penh (600,000) is the capital and largest town of Cambodia. It is centrally situated in relation to the three main lowland areas: the Tonle Sap lowlands, the Lower Mekong lowlands and the Mekong delta. It is the focus of roads and railways, and is the main commercial and industrial centre of Cambodia. Its contacts with the outside world have been considerably improved with the founding of the port of Sihanoukville.

Battambang (29,500), the second largest town, is situated to the west of the northern end of the Tonle Sap, away from the seasonally flooded margins of the lake. It is centrally located in the most important padi-growing area in the country, where modern irrigation works have been constructed and experimental farms set up. It is connected by rail and road with Phnom Penh and with the road and rail systems of Thailand via Poipet at the border.

Siem Reap, which lies near the northern end of the lake, is the main tourist centre of Cambodia, as it is the base from which a



CAMBODIA: POPULATION DENSITY



large number of tourists visit the famous historic ruins of Angkor which is situated north of Siem Reap.

Sihanoukville, a new deep-water port on the Gulf of Thailand, now provides Cambodia with direct access to the sea for purposes of trade. It has several berths for modern large ships and special berths for oil tankers. Expansion of its port facilities is still taking place. As the main outlet of Cambodia, the port is well connected by road and rail with the chief commercial and industrial centre, Phnom Penh. *Sihanoukville* has an oil-refinery and several new industries.

Industries

There are no major deposits of minerals apart from some iron-ore reserves in the north. Industries are not well developed, although the Government has encouraged the establishment of several new industries. Besides rice-milling, sawmilling and sugar-refining, factories have been established to manufacture textiles, cement, paper, leather, tyres, other rubber goods, gunny-bags, glass, plywood, light engineering products and other goods. Most of the industries are located in or near the capital, Phnom Penh, but in Battambang and other towns, especially the new port of *Sihanoukville* on the Gulf of Thailand, some new factories have been set up. Among them are plants in *Sihanoukville* for assembling cars, trucks and tractors.

Trade

The most important exports of Cambodia are rice, timber and rubber. Maize is another important export item. The less important export commodities are pepper, cattle and fish. The total annual exports of rice vary according to the yearly yields. In

one good year recently, more than 500,000 tons of rice were exported, but the amount dropped to 190,000 tons in the following year. Whatever the amount, rice exports are the main earners of foreign exchange. The chief customers of Cambodian rice are France, Singapore, Malaysia, Communist China and Hong Kong.

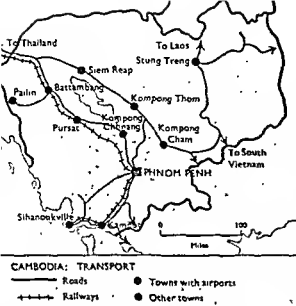
Most of the rubber exports are sent to France, Singapore and Japan. The principal buyers of maize are Japan and Communist China.

The chief imports are iron and steel, machinery and transport equipment, textiles, petroleum, chemicals and drugs. The chief suppliers of these items are France, Japan, Communist China, Malaysia and Singapore.

Transportation

There are only two railway lines in the country. The older and longer line, about 230 miles long, runs from Phnom Penh to Poipet at the Thai border, where it joins the Thai railway system. It passes through the towns of Pursat and Battambang. Another line, a shorter one about 100 miles long, links Phnom Penh to the new port of *Sihanoukville* on the south-west coast. This important railway enables the new port to handle the imports and exports of the country.

There is a fairly satisfactory network of main roads which connect all the major towns with Phnom Penh. Road construction in the Cambodian plains is relatively easy, as the terrain is flat. But the seasonal floods and the numerous streams that have to be bridged have presented difficulties. There are about 4,300 miles of roads, about half of which are all-weather roads. The provincial roads which are not well surfaced have to be repaired every dry season after having been damaged during the rainy season.



The main road network forms a circuit round the Tonle Sap. It starts from Phnom Penh and runs northwards to Kompong Thom, then along the northern margin of the Tonle Sap to Siem Reap and Sisophon, where an extension leads to Poipet at the Thai border. From Sisophon the road runs along the southern margin of the Tonle Sap, passing through Battambang, Pursat and Kompong Chhnang before leading back to Phnom Penh. A second important network serves the south-west region, connecting Phnom Penh with Kampot and Sihanoukville on the coast. A third network leads to the north-east from Phnom Penh, linking the capital with Kompong Cham, Kratie, and Stung Treng on the Mekong. From Stung Treng there is a northern extension to Laos and an eastern extension to South Vietnam. There are several other roads farther south leading from Cambodia to South Vietnam, which show the close connection between Cambodia and Vietnam especially during the period of French rule.

Before the development of the port of Sihanoukville, Cambodians had to travel

abroad or transport their export or import commodities through Thailand or South Vietnam via land routes or the Mekong route. The Mekong route is still in use, though to a lesser extent than previously. The Mekong is, in fact, the main inland waterway. It is navigable by small ships up to 8,000 tons as far as Phnom Penh, and by small river craft as far as Khone across the Laotian border. Beyond Khone the presence of dangerous rapids makes navigation practically impossible.

LAOS

Laos, with a total area of about 91,420 square miles, is the largest country in Indo-China. But it has the smallest population, only about 2.2 million, and the lowest average population density of about 25 per square mile. It is the only land-locked country in South-East Asia, being surrounded by China, North Vietnam, South Vietnam, Burma, Thailand and Cambodia. The country's terrain consists mostly of rugged and sparsely inhabited uplands. Laos is a backward state and has seen little development in recent years mainly because of a long civil war.

Laos may be divided into four main physical regions: (i) the Northern Laos Plateau; (ii) the Annamite Highlands; (iii) the Mekong valley; and (iv) Southern Laos.

The Northern Laos Plateau

This is a large plateau region from which rise many folded mountain ranges. Several mountain peaks reach beyond 8,000 feet. The region is drained by the Mekong and its tributaries and the headstreams of rivers flowing to the Gulf of Tonkin. The plateau surface is very rugged and heavily dissected by rivers which have deep and narrow valleys. Most of the region is occupied by various

hill tribes who grow maize, hill padi and sweet potatoes. Sticklac and benzoin are useful forest products obtained in this part of Laos. Sticklac, used in making shellac, is a resinous substance deposited on trees by certain tiny insects. Benzoin, a medicinal product, is obtained from the bark of the benzoin tree. Around Xieng Khouang there are deposits of iron and copper, but these are not worked because of transport difficulties.

The Annamite Highlands

The Annamite Highlands form a southern extension of the Northern Laos Plateau. The region occupies the greater part of the northern half of the Annamite Chain. There is high mountainous terrain along the eastern Vietnamese border zone, but lower plateau country in the broader western zone, which slopes gently towards the Mekong valley. Most of the upland surface is between 1,500 and 3,000 feet in elevation. With its moderately heavy rainfall, the region is densely forested and thinly populated. The hill tribes who occupy most of the uplands are shifting cultivators who grow maize and hill padi and keep some cattle. In the west-central part of the region, the terrain is lower and the river valleys are wider. Wet padi is grown, mostly by Laotian farmers. The mining of tin is important at Phon Tiu, not far from the town of Thakhek on the Mekong. Most of this upland region suffers from poor communications. There are three mountain passes across the Annamite chain, but these provide difficult routes which are relatively little used for major traffic.

The Mekong Valley

In Laos, the Mekong valley is relatively narrow but provides the best agricultural

land in the country. The alluvial soils here support the highest population density of about 40 per square mile. The inhabitants in this region are Laos, who grow not only wet padi, but also several other crops, including beans, tobacco, coffee and spices. Along the Mekong valley are situated the main towns of the country: Vientiane, the administrative capital, Thakhet, Savannakhet and Pakse. Around these towns are concentrated the chief padi-growing areas of Laos.

The Mekong is navigable only in stretches, as there are frequent interruptions caused by rapids, gorges and obstructions. Between Vientiane and Savannakhet, the river is navigable and is used as the main highway. A road alongside this stretch of the river supplies an alternative transport route to the Mekong.

Southern Laos

Southern Laos in the southernmost part of the country consists of a large plateau area, the Bolovens Plateau, and a broad lowland area, mostly to the west of the Mekong, which merges with the Mekong valley and with the plains of Cambodia. Parts of the Bolovens Plateau are covered with fertile "red land" soils. This plateau is the chief coffee-growing area in Laos. Fibre crops such as kapok, hemp, cotton and ramie are also grown. The lowland area is semi-arid and covered with deciduous forests.

Agriculture

Agriculture is mostly of the subsistence type. Some 550,000 tons of rice are produced annually, but the yields are low. There is often a shortage of rice, so that about 45,000 tons of rice have to be imported annually from Thailand. The padi grown in Laos is mostly

of the glutinous variety.

Lumbering

The extraction of teak is carried out in every region of Laos. It is important especially in Northern Laos, where the main teak-producing areas are near the Mekong. *Elephants and oxen are used in the lumbering operations.* The teak logs are sent down the Mekong to South Vietnam.

Industries

Laos has scarcely started to industrialise. The existing industries include a few rice-mills, sawmills and cigarette factories. The only sizeable industry is tin-mining. The Phon Tiu tin mines near Takhet have been modernised recently.

Transportation

The lack of transport facilities is a great handicap to development. There is no railway in the whole country. There are less than 1,000 miles of motorable roads. The Mekong is the main highway, but it is of only limited usefulness, as its numerous rapids make it necessary for cargo to be transhipped. The Government has, however, used much of the money from foreign aid, mostly American aid, for the construction and improvement of roads

and bridges.

Towns

Vientiane (about 100,000), the administrative capital, is the only important town in the country. It is connected by a ferry across the Mekong with Nong Khai in Thailand. From Nong Khai a railway provides transportation to and from Bangkok. This route supplies Laos with the chief outlet to the sea via Bangkok.

Luang Prabang, the royal capital, is a much smaller town which is situated too far north to be a focus of economic life in the country.

Trade

The main exports of Laos are tin and coffee. Other exports include small quantities of benzoin, timber, sticklac and tobacco. Only a few hundred tons of tin is exported annually, mostly to Singapore. The export of green coffee has been steadily growing. The main imports are textiles, foodstuffs, machinery, transport equipment, metals and metal products.

The total value of imports is nearly forty times that of exports. This is most unfavourable for the country's economy but American and French aid has helped to overcome this difficulty.